

Werner

Let's discuss this at dinner tonight  
at Ramona's - Will you be there?

Geo Hag -

-2

We heard of Dr Geissler's  
von B. notes last Thursday.  
I asked Karl Heimburg to  
talk to Dr Geissler. Sam  
Phillips never intended to  
recommend a  $\Delta P$  of 1.5 -  
just look into it. Herr  
would accept a 1.0  $\Delta P$   
but the sublimator won't  
start beyond  $\sim .4 \Delta P$ .

We agreed to go by  
Hag's findings. He firmly  
recommends "as is" and  
Boeing and Langley, I under-  
stand, now agree w/him.

by  
G



George Hage

from

Brulier & B



George  
Hage  
FYI →

1. Panel Flutter: The decision about further applications of the panel flutter kit will be made by Gen. Phillips, who established a special advisory group on this issue. We understand that his tentative position so far is to eliminate the fix, if the differential burst pressure in the interstage can be kept at 1.5 psi. We feel this would be a reasonably conservative approach and have recommended such a solution previously prior to introduction of the flutter kit. However, this requirement may conflict with the desire of a low pressure in the interstage for sublimator operation and would require drastic reduction of vent area and possibly tighter control of leakage rates. Our recommendation is to accept a differential burst pressure of 1 psi or greater as a solution, rather than a flutter kit. Flutter has been observed in previous flights (without the fix) with amplitudes greater than would have been expected from the ground testing. As a matter of fact some people believe there was some indication of structural failure on 502; however, if this was the case positive proof could not be obtained with the instrumentation available on 502. More severe flutter must be anticipated if higher angles of attack should occur, and if other variables such as dynamic pressure level, material imperfections, natural leakage, etc., combine towards worse conditions. The tests conducted at Tullahoma did not cover a sufficient range of conditions to consider these tests having qualified the S-IVB forward skirt panels and the possibility of structural failure cannot be ruled out.

diffs →

2. 504 S-II Stage Longitudinal Vibrations: Aero-Astrodynamic's analysis of the longitudinal vibration of the S-II stage shows a good stability margin, i.e., we do not have to worry about closed loop (POGO) instability. However, the open loop response of the spacecraft is not negligible, unless the (open loop) engine vibration can be strongly suppressed. Assuming the same thrust vibrations as measured in 503, a longitudinal vibration at the spacecraft of .1 g (single amplitude peak value) at 9 Hz will result, similarly as in 503. However, at 18 Hz, the changed mass distribution and mode shape of 504 will cause a .5 g vibration, compared with "noise level" (below .1 g) at 503. Multiplying these values with the couch transmission factor results in exposing the astronaut to approximately .2 g at 9 Hz and .5 at 18 Hz. Suppression of only the 18 Hz engine vibration will approximately bring us back to the 503 situation. There is a chance, that the 9 Hz vibration was at least partly generated as a subharmonic of the 18 Hz. If this was so, the 9 Hz vibrations would be reduced below the 503 level by suppressing the 18 Hz.

B

3. Dual Mode Lunar Roving Vehicle (DMLRV) Study Support: During the review of proposals submitted by General Motors, Grumman, and Bendix in response to MSFC's RFQ for a DMLRV, the proposal review teams recognized the need for establishing a "baseline" traverse. This traverse would provide the vehicle designer, mission control and operation planner, and the scientific mission planner with a hypothetical traverse which reflects a spectrum of terrains and types of roughness which might be encountered during future lunar exploration missions. Mr. O. H. Vaughn of our Aerospace Environment Division was selected to be Chairman of the "Baseline" Traverse Group composed of members from MSC, USGS, JPL, Bellcomm, and personnel at MSFC who can aid this team. First meeting, to discuss approach, was held Friday, January 24, 1969. ✓



2474

Notes

**SENSITIVE**

GEORGE C. MARSHALL SPACE FLIGHT CENTER  
HUNTSVILLE, ALABAMA

*Handwritten: 2/18/69*

**Memorandum**

TO Dr. von Braun, DIR DATE February 14, 1969  
In reply refer to:  
PD-DIR-69-20

FROM Director, Program Development  
PD-DIR

SUBJECT Results of Proposal Evaluation for Lunar Roving Vehicle  
Phase B Study

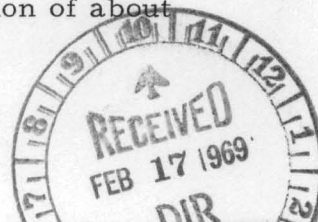
During the week of January 20, a formal technical proposal review was held at MSFC with participants from MSFC and other government agencies. Proposals were received from Bendix, General Motors, and Grumman. The technical evaluation panel members rated each contractor and provided written and oral comments to substantiate their numerical rating. The rating of the three proposals, based on a possible numerical rating of 100, was Bendix 87.5, Grumman 82.1, and General Motors 82.0.

Bendix/Aerospace Division: This proposal was judged to be a definite first choice by the panel. This choice is confirmed by the results of the numerical ratings. A good knowledge and understanding of the study areas was indicated in this proposal and the proposed study team has the appropriate background and experience. A very good approach and study plan were given with a reasonably good technical discussion on each study area. The relatively small subcontract proposed for Lockheed on the crew systems task was considered acceptable since this team has been used by Bendix on previous related studies.

Grumman Aircraft Corporation: The remaining two companies were rated about equal by the technical evaluation panel with a very slight preference for Grumman as second choice. This proposal gave a good technical discussion and indicated recognition of the various problem areas. The prototype and simulation proposed for use in the study were considered very good. The study approach was not well defined and the proposed subcontracts were not satisfactorily explained. The level of effort proposed was considered satisfactory.

General Motors/AC Electronics: This proposal was noted a very close third choice. The technical proposal contained a good technical discussion and was considered acceptable. The GM-Milwaukee participation of about

**SENSITIVE**



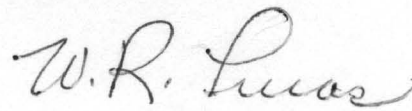


SENSITIVE

2

17% and a subcontract to RCA for about 24% of the manhours were considered to be weak points. It was noted also that the company did not show a proposed per cent of time on the study for the key individuals and also stated that they would not guarantee that the listed individuals would be on the study team.

It is planned that Purchasing will negotiate with all three contractors as the contractors are all technically acceptable.

A handwritten signature in cursive script, reading "W. R. Lucas".

W. R. Lucas

SENSITIVE



NOTES - WILLIAMS - 2/3/69

*agenda held  
suspense. Lucas  
is sending a  
memo.  
B2/4 Feb 2/69*

1. Lunar Roving Vehicle (LRV): The technical evaluation panel for the Phase B LRV study met at MSFC the week of Jan. 20. It is estimated the LRV study should start about Feb. 20. ✓

2. Lunar Mission Planning: We met with other Agency participants in the Phillips/Stoney lunar planning study (for missions after the first landing to vehicle 515) at MSC. Material for the Management Council Meeting was generated and reviewed. The basic recommendations will be to: (1) proceed with the first four missions (1st landing plus three more) and issue a Mission Assignments Document and convene a panel to select sites, and (2) conduct a two month study to define details for remaining flights, prepare a procurement proposal, etc. The material will be reviewed with you on Feb. 3 and will include our assessments and thoughts for the Management Council Meeting. ✓

3. Saturn V Cluster Study: Madewell met with AAP and Systems Engineering personnel on Feb. 1 to prepare material for your review on the potential core program replacement with a dry launched workshop on the Saturn V. This material is in preparation/background for the Management Council Meeting, when Disher will recommend the above change. It is our understanding that the Centers will respond with a 7 - to 10-day study. ✓

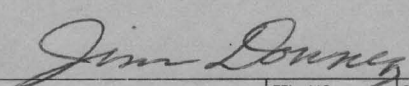
4. ILRV Studies: The following studies were negotiated last week and contracts have been signed:

	<u>Center</u>	<u>Contractor</u>	<u>Funding</u>	<u>Emphasis</u>
<i>Bill Lucas Frank Williams Request briefing on ground rules B</i>	MSFC	GD/C	300K	Flyback and expendable trades with lifting S/C.
	MSFC	Lockheed	300K	One-and-one-half stage concept.
	MSC	NAR	300K	Expendable LV with reusable S/C.
	LaRC	MDC	300K	Selected concepts cover entire spectrum.

Study duration is six months and all four contractors will be working from the same work statement. ✓



2473

ROUTING SLIP			
MAIL CODE	NAME	ACTION	
DIR	Mr. J. Shepherd	APPROVAL	
		CALL ME	
		CONCURRENCE	
		FILE	
		INFORMATION	
cc: DEP-A, Mr. Newby		INVESTIGATE AND ADVISE	
R-SSL-DIR, Dr. Stuhlinger		NOTE AND FORWARD	
R-DIR, Mr. Cook		NOTE AND RETURN	
R-OM-PF, Mr. Read		PER REQUEST	
R-ASTR-DIR, Mr. Horton		PER TELEPHONE CONVERSATION	
		RECOMMENDATION	
		SEE ME	
		SIGNATURE	
<i>Handwritten:</i> Haney - <i>Pls ask Downey or</i> <i>SSL to begin work - Jone</i>			
<p>Reference is made to Dr. von Braun's offer of assistance, Notes 2-3-69 Downey (copy attached), concerning SSL's contamination investigations.</p> <p>We appreciate the offer to help; however, we are presently trying to solve the funding problems within the Science and Engineering organizational framework. We have just provided Mr. Weidner a management summary and status report on our contamination program. We are presently soliciting funding support from several sources.</p> <p>A second problem involves the consolidation of scientific instrumentation for contamination studies into a single area (to be renovated) in Building 4481. A decision on the renovation is urgently required. Mr. Cook and Mr. Read are endeavoring to resolve this problem with Mr. Newby.</p> <p style="text-align: center; margin-top: 20px;">  </p>			
MAIL CODE	NAME	TEL. NO.	DATE
R-SSL-DIR	J. A. Downey		2/12/69



1. CRYSTAL GROWTH STUDIES: Mr. Tommy Bannister presented a paper, "Microscopic Observations of Interfacial Phenomena," at the January meeting of the AIAA in New York. Mr. Bannister's research area applies to crystal growth. He has proposed and developed a prototype flight experiment to observe crystal formation under zero-g conditions. ✓ Mr. Bannister has received a letter from Dr. Martin Summerfield of Princeton University complimenting him on "a very stimulating piece of work and a very interesting presentation." ✓ Mr. Bannister used a film, as a part of his presentation, which showed in high magnification the interfacial activity (between solid and liquid phases) during melting and solidification of hexadecane, a paraffin-like substance. I believe you have seen this film or an earlier version of it. ✓ Dr. Summerfield has requested loan of the film to show to students at Princeton. ✓

2. CONTAMINATION: A preliminary concept of a passive contamination monitor for ATM-A has been provided to the ATM Project Office. The monitor would consist of an array of optical samples to be located in the ATM canister. The samples would be returned to earth for laboratory analysis to provide an indication of the optical degradation to the ATM-A optics over the period of exposure. The contamination problem seems to broaden. Considerable effort in SSL is presently devoted to preparing contamination experiments and to research efforts applied to contamination. Funding is a problem. We are making an appeal to other Laboratories for the loan of laboratory equipment which is needed for our contamination investigations. ✓

J.D.

Are / help? B

3. GRAZING INCIDENCE X-RAY TELESCOPE: Paul Schwindt represented SSL at the Grazing Incidence Optical Technology Meeting held at GSFC on January 29. It was agreed that key areas needing detailed studies are: (1) tolerances on concentricity of nested telescopes, (2) scattering, (3) polishing techniques, and (4) maintenance and testing of mirror figure. The personnel at GSFC definitely thought that 1000 cm<sup>2</sup> collecting area with high resolution was beyond reach for 1975. The grazing incidence telescope promises to be an extremely powerful tool for astronomical and cosmological research. A push forward with the technology is necessary. ✓

J.D.

Any specific suggestions?  
B

MSFC ROUTING SLIP					
	CODE	NAME	INIT.	<input type="checkbox"/>	<input type="checkbox"/>
1	D/R	Dr. W. Braun		A C T I O N	I N F O R M A T I O N
2					
3					
4					

REMARKS

*He 2-18 m. 2/19*

CODE <i>PM-3/AA-MGR</i>	NAME	DATE <i>2/11/69</i>
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MSFC - Form 183-1 (July 1966)



NOTES

FEB 11 1969

NOTE TO: Dr. von Braun, DIR *B 2/14*  
FROM : Manager, Apollo Applications Program,  
PM-AA-MGR  
SUBJECT: Comments on Weekly Notes

ATM GSE:

Reference Notes 2/3/69 Haeussermann. MSFC was directed to secure a separate contract with GE, as required for AAP ESE, rather than supplement the Apollo contract. A six month design effort is now under contract with a total program contract to start July 1, 1969, for ATM ESE and other similar efforts, if R&DO is unable to continue their planned AAP work in ESE and funds are available for contractor design effort. ✓

DOCKING HARDWARE RESPONSIBILITY:

Reference Notes 1/27/69 Heimburg. A memorandum was recently sent to P&VE confirming our discussions with them on the roles of MSFC and MSC in regard to CSM docking hardware. The memo states that MSC is being requested to continue to handle the operational docking hardware interfaces and its qualification, using a non-operational interface (field splice) with MSFC provided modules. MSFC's primary responsibilities will be the following:

- a. Identify the hardware to be procured;
- b. Co-produce, with MSC, umbilical physical, functional, and procedural ICD's;
- c. Identify and define specific cluster systems requirements which would be placed on the docking system. ✓

The implementation plans will be worked out through the MSFC/MS inter-Center panels.

*Leland F. Belew*  
Leland F. Belew

Copy to:  
PM-DIR, General O'Connor



B 1/31

mmms  
unmmms

1. AAP -2 GENERAL: R&D is presently reviewing the combined McDonnell Douglas Aircraft Company (MDAC) contract scope with a scheduled completion date of 1-30-69. The scope of this contract represents \$247M and appears greatly expanded (\$115M at MDAC/St. Louis and \$132M at MDAC/Huntington Beach). In other terms, we are reviewing \$25M of AAP prime contractor cost per day of review time. The short time available makes a complete review almost impossible and we are greatly concerned about the quality and validity of our evaluation. We may later on regret not having taken more time for this effort. ✓

Lee  
Zeller  
FYI B

2. J-2 ENGINE OSCILLATIONS: A test program conducted at MSFC has shown that J-2 engine oscillations as observed in S-II-503 flight are related to LOX pump NPSH. Oscillations were initiated or damped by decreasing or increasing NPSH respectively. An Engineering Change Request has been issued to increase LOX ullage pressure on S-II-504 by adding a pressurization step at time base 3 + 100 seconds. The increased pressurization will preclude operation at the LOX NPSH levels at which pump oscillations were encountered during flight of S-II-502 and S-II-503. ✓

3. S-II-3 and S-II-4 CROSSBEAM: We have looked into the possibility of adding ballast weight to the crossbeam, as suggested during the LDX meeting. It would have required approximately 4000 lbs. to be added to the S-II-3 gimbal block location; a smaller amount would be required for S-II-4. However, it is physically impossible to locate such a weight on the gimbal block and a distributed weight is only partially effective. ✓

4. BIOMEDICAL EXPERIMENTS: (a) Mr. Ken Hecht is now Assistant Chief for Engineering in the Biotechnology Office of the MSC Medical Directorate. As Assistant to Dr. Armstrong, he will become intimately involved in our biomedical experiments activity. (b) USVMS Demonstration: About 20 MSC personnel saw the demonstration, including Doctors Armstrong, Fisher, Rambaut, Wheler, Johnson, and others. IO and MDAC personnel also attended. The presentation went well and was favorably received. This concerned the same instrument we showed you in our Materials Division last week. ✓

K.H.

2  
Please avoid such abbreviations  
R

unmmms  
2/1/69

5. AAP HARDWARE RESPONSIBILITY AND INTEGRATION: We have been seeking a decision as to MSFC's role in docking hardware integration. If MSFC is responsible for docking hardware to function properly in space, we and R-QUAL have outlined a program to implement our requirements for checkout operations and equipment. If MSC is responsible, our equipment will be much simpler. The problem is becoming urgent as we (R&D) need to begin design and manufacturing of the equipment. ✓

Lee Zeller  
Hope this is classified soon  
B

6. MSFC SKIN-STRINGER PAYLOAD ENCLOSURE: Acoustic testing on a 36" X 36" skin-stringer ring-frame shell has been completed. The purpose of these tests was to evaluate skin-stringer ring-frame noise reduction characteristics as opposed to that of the previously tested monocoque shells. These tests were accomplished with and without a helium purge. As expected, the panel edge and corner mode acoustic radiation was much greater than that of the monocoque shell. Even though the acoustic energy radiated into the inner volume was much greater than previously experienced, the helium purge still gave an 8 dB noise reduction. This additional testing has given increased confidence that the higher acoustic levels of the payload enclosure can be adequately attenuated. ✓

I answered in special note 2/1/69



B 2/4

1. Inhouse Fabrication for ATM. The Astrionics Laboratory notes of January 13, 1969 reported a potential deficit on manpower requirements for ATM inhouse fabrication. The proposed solution is as follows:

a. The ME Laboratory and the Astrionics Laboratory's Pilot Manufacturing Branch will fabricate the airborne electrical hardware which includes all electrical distributors, special power supplies and the charger/battery/regulator modules. One-half of the civil service manpower available for electrical equipment from the Pilot Manufacturing Branch has been allotted to these ATM efforts; ME will utilize its available capacity; and the balance will be accomplished through off-site fabrication by ME and Astrionics. A work breakdown and schedule have been agreed to by ME and Astrionics. ✓

b. The remainder of the total ATM effort involves GSE hardware such as cables and electrical support equipment. A proposal has been made to the ATM and GSE offices of IO/SAA that this GSE hardware be fabricated under the GE contract. ✓

2. ATM Program Review. The inhouse monthly program review on ATM was held last week. The most significant item of the review was the expected schedule slippage of the ground test articles. The slippage of the thermal test article is of most concern due to its potential impact on the design and layout of the rack. Efforts are underway to get the hardware back on schedule. MSC personnel have been invited to attend these reviews as observers. Glenn Smith and a few others from the MSC Project Office attended this review and participated as observers. ✓

Lee Belar  
Can this  
legally be  
done, please  
it is clearly  
non-prolto  
B

→ I answered in ~~the~~ <sup>special</sup> 2/10 notes

SR.

2/10

NOTES BALCH 2-3-69

B  
2/4

MISSION:

S-II-6 - Stage was shipped to KSC early Saturday morning 2-1-69. ✓

S-II-7 - Stage is in the A-1 test stand undergoing post static checkout and modifications. Removal from the test stand is scheduled for 3-13-69. ✓

S-IC-9 - Power-up was completed on 1-27-69. Stand is presently undergoing pre-static checkout and modifications. Static firing is still planned for 2-19-69. ✓

BOMEX

Two more signal conditioning and recording Devices (SCARD) successfully completed accepted test on 1-29-69 making a total of three units accepted to date. The entire job of fabricating SCARD and decommutation units is approximately 30 days ahead of schedule. ✓

We were encouraged to learn that the first SCARD completed and shipped was installed aboard ship "Discoverer" without any problems and that transportation had no adverse effects on the unit as evidenced by its fit and functional checkout. ✓

Negotiations have been completed for the installation and checkout of SCARDS aboard ship (job No. 2) and for the development of soft ware for three of eight core experiments (a portion of job No. 3). The firm fixed price in each case was well within the budget allocation. ✓

INSTALLATION

University Research - As a result of discussions with Mr. Hueter, Col Mohlere and other MSFC representatives concerning MTF support to Louisiana State University research task at MTF, it was decided that we would furnish General O'Connor's Office a brief discussion of each of the five tasks authorized and a detailed cost estimate for supporting each task. This material was submitted on 1-29-69 and as a result we have had informal discussions with MSFC personnel but no formal response. ✓

Personnel of the Bureau of Public Roads visited MTF on 1-31-69 to explore the prospect of utilizing certain MTF facilities for research activities. ✓



IAM STRIKE AT MDAC - EASTERN DIVISION: The International Association of Machinist's Union is still on strike at McDonnell Douglas Astronautics Company-St. Louis. Unofficial word indicates that the aircraft company, where the majority of the union people work, is ahead of schedule on delivery of airplanes and is not overly concerned about the strike. No appreciable affect on the Airlock program can be foreseen at this time. ✓

ELECTRICAL SUPPORT EQUIPMENT REQUIREMENTS FOR AAP-2 AND AAP-4: After a detailed survey of ESE requirements for AAP-2 and AAP-4, coupled with R&DO announcement that design and fabrication of ESE would require contractor support, a tentative decision has been made to utilize General Electric (GE) for this activity. This decision will be final only after approval of the standard procurement plans by the Center and Headquarters. ✓

ATM "BLACK BOX" CRITICAL DESIGN REVIEWS (CDR'S): As an indication of the ATM design status, the following "black box" type items will undergo Critical Design Review (CDR) in February 1969.

1. Switch Selector
2. Exploding Bridge Wire (EBW) Firing Unit
3. Solar Array Wing Assemblies
4. Control Computer Assembly
5. Tape Recorder
6. Signal Conditioning Rack
7. Acquisition Sun Sensor Assembly
8. Acquisition Sun Sensor Electronic Assembly
9. Aperture Door Torque Motor Assembly
10. Experiment Package Structure and Layout ✓

MARTIN CONTRACT DEFINITIZATION: On January 29, 1969, Martin signed the negotiated contract. Subsequently, review of the total contract package was completed; the contract was signed by Colonel Hirsch, reviewed by Mr. Davis, and handcarried to Headquarters February 3. As previously reported, this is ahead of the official schedule to allow definitization by March 31, 1969. ✓✓

NOTES 2-3-69 BROWN

B  
e/A

*attached* F-1 ENGINE - Reference is made to your question on my notes of 1/6/69. As you have pointed out, the extremes of temperature and wind at KSC are known historically. However, the problem which arose during AS-503 CDDT (low engine temperature, aggravated by the missing fuel inlet boots) is caused by our inability to adjust the flow rate and/or temperature of the cocoon purge gas after the vehicle leaves the V.A.B. The cocoon purge gas adjustments are made in the V.A.B. about three to four months prior to launch, and, even when the GSE heater is not operating at its capacity (only about 49% of capacity for AS-503, for example), a special test set-up is required to adjust the heat input to the cocoon. In the case of AS-503, the setting up of this test would have delayed the launch. The problem is further complicated because the MSFC criteria are defined in terms of  $\text{GN}_2$  heat flow at the umbilical, but this has never been measured during CDDT or launch. Consequently, the temperature drops in the purge gas supply are not understood very well. Further, the adjustments made in the V.A.B. are made without hook-up to the insulated engine. Therefore, because of the number of uncertainties involved, it seems prudent to explore engine operation at conditions below the originally specified temperatures. In addition, R-AERO and R-P&VE are exploring ways KSC might improve the control of the environmental temperature under the cocoon. ✓

J-2 ENGINE - A Letter Supplemental Agreement was issued on January 31, 1969 to Rocketdyne for the continuation of J-2 Engine Operational and Flight Support effort. The period of the Letter Supplemental Agreement is January 1 through March 31, 1969. The definitive contract will cover the effort from January 1, 1969 through June 30, 1970. ✓



VISITORS TO MAF

On thursday, January 30, 1969, Mr. Joe Simon, Executive Vice President of the Chamber of Commerce of the Greater New Orleans Area and representatives of the Chamber's Industrial Development Committee, were briefed on current and projected status of work at MAF by G.N. Constan, NASA Manager, H. D. Lowrey, President, CCSD and Harvey Gunning, Michoud Manager for the Boeing Company. ✓

On Thursday, January 30, 1969, Michoud was host to dignitaries from 22 nations participating in a General Development Course sponsored by the Economic Development Institute of the International Bank for Reconstruction and Development. The group, accompanied by four members of the EDI staff and two Executive Directors of the World Bank, was briefed on organization and planning techniques by NASA Deputy Manager James Stamy and on training and manpower by James Hughes of the Boeing Company. Upon completion of the briefing the group was given a tour of the manufacturing building and the VAB. ✓

TV ACTIVITIES AT MICHLOUD

On Monday, February 10, 1969, a five-man crew from CBS, New York, will film activities of Chrysler and Boeing at the Michoud Assembly Facility. This will be used in a Special CBS is making on the Apollo 9.

On Tuesday, February 11, 1969, a TV film crew of USIA will be at Michoud to film Boeing's activities on the Saturn vehicle. This film will be used in a TV program being produced by USIA for Thailand. ✓

1. CRYSTAL GROWTH STUDIES: Mr. Tommy Bannister presented a paper, "Microscopic Observations of Interfacial Phenomena," at the January meeting of the AIAA in New York. Mr. Bannister's research area applies to crystal growth. He has proposed and developed a prototype flight experiment to observe crystal formation under zero-g conditions. ✓ Mr. Bannister has received a letter from Dr. Martin Summerfield of Princeton University complimenting him on "a very stimulating piece of work and a very interesting presentation." ✓ Mr. Bannister used a film, as a part of his presentation, which showed in high magnification the interfacial activity (between solid and liquid phases) during melting and solidification of hexadecane, a paraffin-like substance. I believe you have seen this film or an earlier version of it. ✓ Dr. Summerfield has requested loan of the film to show to students at Princeton. ✓

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Acc /  
help? B

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J.D.

Any specific  
Suggestions?  
B



1. H-1 ENGINE PROGRAM: The H-2039 turbopump piece parts have been evaluated by P&VE, Rocketdyne, and this Laboratory. The individual parts did not reveal any undesirable conditions resulting from the five-year storage period without representations. ✓ Based on the condition of the pump and twelve other turbopumps used in the Atlas and Thor programs, P&VE is recommending that the turbopump preservation requirement be increased from 24 months to five years. This change would also be applicable to the F-1 engine program. ✓
2. S-II PROGRAM: Personnel of this Laboratory have completed a re-review of all weld X-ray films on S-II-7, -8, and -9 and have completed 70 percent of the re-review on S-II-10. Most of the effort was conducted with 7-10 power magnification. To date, a total of 21 indications have been found on the films, and all have been dispositioned use-as-is or reworked. ✓

B 2/4

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Lee Belser  
Can this  
legally be  
done, since  
it is clearly  
non-Apollo?  
B



B  
2/4

1. SPACECRAFT 104: Our consultation has been solicited relative to a materials incompatibility in the Apollo 104 LOX tank (fuel cell system). Reportedly, a piece of Buna-N rubber from a quick disconnect coupling O-ring seal is suspected of being inside the tank. The missing piece is judged to be about 0.250 x 0.020 x 0.030 inch. The LOX tank contains a recirculating and discharge pump with an aluminum impellor and operates at 1050 psia. NR/SD wants to waive the incompatibility and try to show experimentally that the condition is acceptable. We believe that no test program will be of any value and that a potentially dangerous situation exists since Buna-N is sensitive to reactions in LOX and sources of reaction energy exist inside the tank. ✓
2. SATURN V STRUCTURAL CAPABILITY: A preliminary review by our Structures Division has shown that the structure is capable of carrying 107,300 lbs. of payload on the assumption of 4.0 g's limit at cutoff and skin temperatures no greater than experienced on earlier flights. Some acceptable reduction in safety factors would result for malfunction loading. Also, wind restrictions for lift-off twang effect would be slightly greater. ✓
3. POGO: Analyses have been completed on AS-504 by MSFC and contractors. MSFC's nominal case with Boeing corrected coupled modal data for S-IC is a minimum stability margin of -5.3 db at lift-off. Contractor stability studies show a minimum margin of -39 db and -35 db for S-II and S-IVB respectively. Tolerance cases studies by MSFC and contractors showed no instabilities. Oscillatory loads predicted using the POGO fix for AS-504 are slightly higher than the AS-503 nominal loads but within the astronaut criteria. ✓
4. BIOMEDICAL EXPERIMENTS PRELIMINARY REQUIREMENTS REVIEW PRE-BOARD MEETING: The Pre-board PRR on the MSFC committed experiments took place at MSC on Thursday and Friday of last week. Approximately 50 RIDs were submitted by the MSFC Biomedical Task Team Members in attendance. While we are still concerned about the appreciable amount of document action being imposed, the general tenor of compromise at the meeting, plus the very favorable interpersonal relationships in evidence during the meeting causes us to remain optimistic about our ability to do the job. ✓
5. COOPERATIVE PROGRAM WITH ALABAMA A & M: We have been requested to assist an Alabama A & M Professor, Dr. Manger, in the accomplishment of polymer research he is doing. Certain of the analyses required by Dr. Manger has required he work in cooperation with an industry in Great Britain. We can accommodate his needs, thus significantly improving his reaction time. Appropriate management has been notified of this cooperative effort. ✓
6. MCDONNELL DOUGLAS AIRCRAFT COMPANY (MDAC) CONTRACT REVIEW: The technical review has been completed and results are being transmitted to I-S/AA today. Details of the food and waste management proposal were insufficient for evaluation and we are recommending a definition phase. ✓
7. AAP WEIGHT STATUS: AAP-2 will be in serious weight trouble again very soon. The problems are: design weight growth with maturity, reduction in performance from flying the S-IVB propellant utilization system open loop, and the impact of the stowage problem. The only known potential performance improvement remaining is delaying the passivation impulse by one half orbit, which appears feasible. ✓

1. RADIOGRAPH ENHANCEMENT USING OPTICAL SCANNER AND DIGITAL COMPUTER: A survey of industry has just been completed to determine the existing capabilities in the field of Radiograph (X-ray) Enhancement. The survey was a joint effort of the Systems Analysis Branch, Computation Laboratory, and Applied Technology Branch of Quality and Reliability Assurance Laboratory.

The objective was to determine if, by filtering and enhancing, the image of a faulty weld that had been pre-recorded on an X-ray, could be improved to such a degree that it would greatly assist an X-ray analyst in determining the exact nature of the flaw and its affect on the strength of the metal.

Sample X-rays were scanned, the data digitized and then filtered on a digital computer. The delta improvement was very encouraging. The applications of such a system at Marshall would be rather broad. In addition to the present analysis of X-ray taken of the S-II stage, such a system can be utilized in quality control of any component or vehicle where welding is involved. The next logical step is to have a feasibility study performed to determine the optimum hardware configurations, their related cost analysis, and to get the design specifications for required software filters. ✓

2. FEDERAL DATA PROCESSING CENTER (FDPC): Moving of the two IBM 7094 systems from Computation Laboratory to the Federal Data Processing Center building on Jordan Lane has been completed with no loss of operation time. ✓

Under a supplemental agreement with GSA, transfer of the equipment will become effective February 1, 1969. MSFC will continue to operate the facility through the Computation Laboratory's support contractor (CSC) for the rest of FY-69 on a reimbursable basis.

MSFC will have priority on all computation work performed at the FDPC and will pay GSA at the rate of \$66 per hour. This rate is no more than the cost per hour for operating the IBM 7094 systems in-house.

The FDPC appears to be running smoothly and is providing timely computer support for MSFC, including preparation for our next launch. ✓



1. Option Capability for Apollo 10 Mission: General Phillips' MA-412 TWX dated January 28, requires MSFC to maintain an option supporting an earlier launch of AS-505 in the event a repeat of some form of the "D" mission is required. A Flight Program delivery to KSC in early March is planned to support KSC's contingency planning for this option. This program will be developed from the Apollo 10 tape using the same launch into orbit phase with an alternate sequence inserted consisting of the transposition, docking, and LM extraction occurring in earth orbit after the S-IVB tanks have been vented down and the vent valves closed. ✓
2. MSFC Planning for Procurement of Follow-on Vehicles: Presentation you saw January 23 was presented by Horton Webb to Chuck Mathews, General Bogart and Mr. Whittaker on Tuesday, January 28. Part I, on consolidation planning, was well received. Part II, concerning stretch-out of test schedules at MTF, was not considered timely since the LEO planning changes all schedules. We will pursue this further when the LEO planning is finalized. Headquarters comments have been included in the consolidation planning presentation and we expect to present it to Dr. Mueller at the Executive Session of the MCM at KSC, Tuesday, February 4, 1969. ✓ Gas  
crashed  
out of  
overcrowded  
agendas  
PB
3. S-II Stage Insulation: Progress has been made in resolving the problem of cork over spray foam insulation on the S-II Stage. Four different configurations of foam/cork/honeycomb insulation have been undergoing testing at Wyle Labs in California since January 22. Testing under the most severe test conditions has been successfully completed on all three specimens of one configuration and two specimens each of the other configurations. All testing is to be completed by February 3, 1969. ✓
4. Dr. Mueller's Visit to MDAC on Friday, January 31, 1969: Mr. James C. McCulloch, S-IVB Stage Project Office, and Mr. W. Simmons, AAP Orbital Workshop Office, attended the general discussion session which Dr. Mueller had with MDAC top management at Huntington Beach last Friday. Messrs. Bromberg and Rogan represented MDAC since Messrs. Able and Burke had to attend a Board Meeting in St. Louis on that date. Most of the discussion centered on cost. Dr. Mueller told MDAC that to stay in business the cost of the S-IVB would have to be reduced from \$20M to \$10M and the engineering associated with the low cost stage would have to be accomplished within the present budget. He also asked if MDAC had developed a position on eliminating S-IVB static firing and was told that they had advised MSFC that it was feasible without undue risks. Dr. Mueller will probably bring this up at KSC this week. Dr. Mueller also commented on the increase of the OWS (Airlock, etc) Program cost by a factor of 6 (\$50M to \$300M). Dr. Mueller is at Downey today to discuss CSM and S-II status with NAR. Bill LaHatte is attending the meeting. ✓



B2/4

Research Achievements Review (RAR) - On January 30, the technical contents, progress and achievements made by the Center in its Research Program in Thermal Physics and Thermal Engineering were presented. As you are aware, much of the work in this area is conducted in the Thermal Physics Division of the Space Sciences Laboratory. Therefore, most of the presentations were on SSL activities; however, both Astrionics and P&VE also reported on significant research accomplishments completed in each lab within the past 12 to 24 months. The total attendance at the review was slightly less than usual. Compensating to some extent for the decrease in total numbers of people was a somewhat higher representation than usual from Headquarters, other centers and other government agencies.

The presentations were excellent. However, the effectiveness of the review is somewhat in doubt, since the trend of non-attendance and non-participation in these technical symposia by the many representatives of center management continues.

Jim Shepherd, Bonnie O.K. BLW  
2/7

I'd like to make a grave  
effort to attend these more  
regularly. Please assist me in  
doing that. B



B  
2/4NASA HEADQUARTERS DIVISION OF PRESIDENT'S FY-70 BUDGET

On January 23, we received Center level controls, established by NASA agency within the President's FY-70 Budget submitted to the Congress on January 15, as follows:

	(Millions of Dollars)		
	<u>FY-1968</u>	<u>FY-1969</u>	<u>FY-1970</u>
<u>OMSF</u>	<u>2,809.2</u>	<u>2,177.5</u>	<u>2,007.5</u>
MSFC	1,151.6	668.6	690.7

Within MSFC the division is as follows:

Apollo	992.5	583.5	503.7
Space Flight	159.1	84.2	186.1
Operations *			
Advanced Missions	0	.9	.9
<u>OSSA</u>	<u>552.9</u>	<u>438.4</u>	<u>558.8</u>
MSFC	1.0	1.8	1.3
<u>OART</u>	<u>315.0</u>	<u>285.2</u>	<u>290.4</u>
MSFC	16.8	11.6	13.6
<u>OTDA</u>	<u>275.9</u>	<u>279.9</u>	<u>298.0</u>
MSFC	.4	.3	.4
<u>R&amp;PM (AO)</u>	<u>639.3</u>	<u>648.3</u>	<u>650.9</u>
MSFC	126.2	116.4	112.2
<u>C of F</u>	<u>33.5</u>	<u>35.7</u>	<u>58.2</u>
MSFC	1.2	1.6	2.1

Total Budget Comparison of MSF Centers (Including RD, AO & C of F)

MSFC	1,297.2	800.3	820.3
MSC	1,327.6	1,188.0	1,042.4
KSC	488.8	494.8	456.9

\*Includes AAP

ALABAMA A&M COMPUTER CENTER: Some considerable favorable attention has been given the Center's application of the Ames type agreement with Alabama A&M. Clyde Foster of Comp Lab has, under the terms of the agreement, made substantial contribution to the establishment at A&M of a Computer Science Center. This activity now shows 48 students engaged on the IBM 360-30 equipment of the College and interest continues to mount. Dr. Morrison is quick to acknowledge this vastly significant assistance by the Marshall Center without which there would have been only a room full of idle or under-employed computer equipment. We have not been backward in citing this example of MSFC-University cooperation. One day, when your schedule permits, I should like to arrange for a visit to the A&M Center and a talk with Dr. Morrison.

DEVELOPING COLLEGE PROGRAM: Marshall has received very favorable notice for the advanced degree of its participation in the Developing College Program. In fact, there are indications that the Office of University Affairs may not only increase the MSFC funding quota--a very modest sum--but may delegate administration to the Center. This program seeks to appraise the capabilities and potential of colleges that are or recently have been underprivileged. The appraisal is actually conducted by one of the colleges, in this case by Alabama A&M. Schools involved are: Alabama College, Fisk, Miles, Oakwood, Stillman, Talladega, Tennessee A&I, and Tuskegee. ✓

STEP FUNDING: In previous years, Marshall has eschewed the use of the research project grant in favor of the contract approach, not without justification. However, this effectively eliminated MSFC from the matching fund advantages of step funding and the desirable gradual phase-out feature of such funding. This year we have 3 specific grants as follows:

Georgia Tech	- \$ 50,000
LSU	- 100,000
MSU	- 100,000

Chances are good that these will be step funded later. The beginning is modest since the PAD involved shows a total of 272 such grants across the NASA Center System. ✓



Safety Review of the Neutral Buoyancy Simulator Operation:

The MSC Manager, Orbital Assembly Project Office, has officially acknowledged that the MSFC Neutral Buoyancy Simulator satisfactorily meets the MSC requirements for participation of MSC personnel in underwater space simulation testing. The first astronaut participation in pressure suit testing is scheduled for February 18, 1969. Some minor changes have been made to the equipment since the completion of the Operational Readiness Inspection (ORI) last fall. Therefore, in coordination with ME and Environmental Health, we have scheduled a follow-up review to the ORI. This short review will be completed prior to February 18, 1969, to assure the best possible safety posture when the astronauts start underwater operations in pressure suits. ✓

B  
2/4MANPOWER STATUS:

It now appears that MSFC will be unable to meet the year-end ceiling of 5981 if the attrition rate continues at the present level. The end-FY 69 ceiling was developed by OMSF based on an extremely liberal interpretation of the Center's attrition history. That prediction is not being borne out by our actual attrition. We normally experience four peak attrition periods each year usually in September, December, March, and June. During this fiscal year, however, no such peaks have occurred. The average attrition required to meet the new ceiling was 11 people per week. Our year-to-date actual attrition has averaged 9 people per week. We began the fiscal year with 6440 people. As of January 30, 280 people had separated. Since July 1, we have hired a total of 81 people. Sixteen of these were wage boards and technicians whose re-hire was necessitated by the NASA-CSC agreement and Judge Holtzoff's decision to lift the injunction on the RIF. Twenty-five were clerical personnel hired against FY-68 commitments and carried over into FY-69 on temporary appointments. The remainder included four business professionals and 36 engineers which represented our FY-69 college recruiting commitments. Of the 81 new hires, 71 were added by September 30 and we have added only 10 since that date. Our January 30 on-board strength is 6241. If we project attrition to June 30 at the rate of 9 per week (year-to-date average), and assume no further hiring, the Center would end the fiscal year with an on-board strength of 6043. This is 62 over the target of 5981. The problem is further complicated, however, by the existence of seven PhD commitments at the GS-12 level, made in FY-68, and one military returnee. We are preparing a letter to OMSF requesting guidance on honoring the PhD commitments this fiscal year or extending them to FY-70. Additionally, we will be unable to hire approximately 30 co-op students graduating between now and June. Although we are hopeful of some increase in attrition, there is no reason for us to expect a large rise by June 30 since there are, according to the State Employment Service, approximately 1200 engineers on the open job market in the Madison-Limestone County area at the present time. It also appears that the Army buildup does not offer much potential relief in the near future. We are carefully watching this situation and will develop alternatives through which it could be mitigated should the present course continue. ✓



NOTES 2/3/69 RICHARD

B<sub>2/4</sub>

No submission this week.

1. S-II Stage: Qualification tests are still in process to qualify the cork/foam insulation now being installed in some critical areas of the S-II-8 stage. Completion date of tests was February 1. Four of the eight specimens have successfully been qualified; one has been tested, three remain to be tested. ✓

2. Neutral Buoyancy Activities: Concurrence for astronaut participation in neutral buoyancy simulation programs was received from MSC in Houston. Mr. Jack Joerns of MSC was designated as the principal test director for all tests involving astronaut participation. Mr. James Splawn will represent MSFC as Mr. Joerns' counterpart and single point of contact for neutral buoyancy test operations. Astronauts Weitz, McCandless, Garriott, and Gibson visited the neutral buoyancy simulator to review the status of the neutral buoyancy hardware. Commander Weitz and Lt. Commander McCandless went in the neutral buoyancy tank using SCUBA gear. They investigated the crew quarters and the MDA and airlock areas. ✓

3. Space Station Integrated Payload Planning Activity: As part of a progress meeting at Hq, a plan which discusses the manufacturing module of the proposed space station was presented by us to the NASA Headquarters Experiments Payload personnel responsible for the workscope for the Phase B space station study. The space manufacturing module proposal was well received by the Experiments Payload group who are oriented toward performing specific and tangible tasks in space. OART personnel at the meeting stressed the need for more basic investigations. (In the proposed module both fundamental and product-oriented experiments will probably be performed. What the experiments will be depends on the outcome of fundamental studies in which we are engaged and on the results of the AAP-2 flight experiments.) Langley personnel also presented their program for participation in the space station. Interestingly, their plan covers such ME type activities as space manufacturing, fabrication and assembly, maintenance and repair, a space hangar for repair of satellites, and systems for capture and transfer of satellites to the space hangar. ✓

4. ATM Camera Test Chamber: We are building for ASTR a vacuum chamber to be used for testing ATM cameras. The chamber is 4 feet in diameter and 25 feet long. The chamber is made up of three cylindrical sections and two end domes. All sections ride on rails and may be separated at any of the four joints. Additionally, the chamber has about 50 penetrations for pumps, instruments, etc. The chamber is supported on vibration isolation mounts. To achieve a vacuum level of  $10^{-8}$  Torr, the inner walls and equipment supports are hand-polished to a high luster finish and baked.  $LN_2$  shrouds are used as well as an LHe shroud in one section. To date, we have installed the supporting rails, two domes and one cylindrical section. We expect to complete shipment of all other items by the end of February. ✓



NOTES 2/3/69 SPEER

B  
2/4

1. AS-504 Launch Mission Rules Review: The 504 Launch Mission Rules Review was held Thursday at KSC with Hage and Petrone attending. Preceding the review MSFC presented a well-received, in-depth briefing on the space vehicle ground wind constraints, which was a coordinated effort of AERO, P&VE and my office. I would like to express my appreciation for the fine work and cooperative spirit of the Labs in this. Hage has requested a brief summary of this briefing at the Flight Readiness Review. The Launch Rules Review itself was routine and presented no major problems. It has been decided that the 504 launch window "panes" presented at the Flight Mission Rules Review (Notes 1/27/69 Speer) for optimum LM rendezvous operations will not be a constraint on launching time. They will be exercised in real time as highly desirable preference if convenient. ✓
2. Onboard/Ground Computer Interface: In the November Management Council Meeting it was stated that MSFC was not giving MSC the information they needed to define the relationships between the onboard and the ground software. In subsequent discussions we pointed out specific meetings which had been held between MSFC and MSC in this area and MSC withdrew their comments. In the meantime, both Astrionics and my office have continued to work the areas affecting this interface. A meeting on January 17, 1969, was chaired by Mr. Chubb of R-ASTR-N in which he gave Mr. Quinn of MSC/FSD preliminary documentation defining the equations needed to update the onboard computer as well as ground simulation requirements. MSFC is well aware of MSC's needs in this area and I believe they are being pursued in a timely manner. ✓
3. Tracking and Data Acquisition Planning Panel: The first meeting of the Tracking and Data Acquisition (T&DA) Planning Panel was held at NASA Headquarters on January 28. H. Golden of this office attended. The main purpose of this initial meeting was to review the objectives of the T&DA Panel and to map out the panel's future course of activities. Other items of discussion were communications from the far side of the moon, the political advisability of deleting overseas tracking sites, and flight data flow and control. ✓

NOTES 2-3-69 Stuhlinger

B<sub>2/4</sub>

No submission this week.



1. Lunar Roving Vehicle (LRV): The technical evaluation panel for the Phase B LRV study met at MSFC the week of Jan. 20. It is estimated the LRV study should start about Feb. 20. ✓

2. Lunar Mission Planning: We met with other Agency participants in the Phillips/Stoney lunar planning study (for missions after the first landing to vehicle 515) at MSC. Material for the Management Council Meeting was generated and reviewed. The basic recommendations will be to: (1) proceed with the first four missions (1st landing plus three more) and issue a Mission Assignments Document and convene a panel to select sites, and (2) conduct a two month study to define details for remaining flights, prepare a procurement proposal, etc. The material will be reviewed with you on Feb. 3 and will include our assessments and thoughts for the Management Council Meeting. ✓

3. Saturn V Cluster Study: Madewell met with AAP and Systems Engineering personnel on Feb. 1 to prepare material for your review on the potential core program replacement with a dry launched workshop on the Saturn V. This material is in preparation/background for the Management Council Meeting, when Disher will recommend the above change. It is our understanding that the Centers will respond with a 7 - to 10-day study. ✓

4. ILRV Studies: The following studies were negotiated last week and contracts have been signed:

Bill Lucas  
Frank Williams  
Request briefing on groundrules  
B

<u>Center</u>	<u>Contractor</u>	<u>Funding</u>	<u>Emphasis</u>
MSFC	GD/C	300K	Flyback and expendable trades with lifting S/C.
MSFC	Lockheed	300K	One-and-one-half stage concept.
MSC	NAR	300K	Expendable LV with reusable S/C.
LaRC	MDC	300K	Selected concepts cover entire spectrum.

Study duration is six months and all four contractors will be working from the same work statement. ✓

Feb 10, 1969



MSFC ROUTING SLIP				
	CODE	NAME	INIT.	<input type="checkbox"/> A <input type="checkbox"/> C <input type="checkbox"/> T <input type="checkbox"/> I <input type="checkbox"/> O <input type="checkbox"/> N
1	DIR	Mr. Shepherd		<input checked="" type="checkbox"/> INFORMATION
2				
3				
4				

REMARKS

Jim:

Re: Telecon this AM regarding status of a P&VE procurement action on Materials Processing in Space.

The following info provides the status as of 4/11.  
Please advise if additional info is needed.

129-03-15-44 "Preparation of Materials in Space"  
The work unit covers research on crystalline materials in a low "G" environment as proposed by the General Electric Company.

The Research and Technology Resume dated 9-15-68, requesting \$60,000 was submitted to Headquarters OART for approval. Program Authority in the amount of \$35,000 was received March 25, 1969. A PR for this amount, resulting from an unsolicited proposal from G.E., was processed to FMO on March 26, 1969. This procurement was assigned to Mr. Crawford in Purchasing. He advised this date that he had requested additional information from the contractor. Early response is expected and obligation is anticipated within six weeks.

CODE S&E-R-DIR	NAME John Chase,	DATE 4-11-69
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# OFFICE OF DIRECTOR - MSFC

CODE	NAME	INIT.	<input type="checkbox"/> ACTION	<input type="checkbox"/> INFORMATION
DIR	Dr. von Braun	4/2		
		4/2		
	B 3/31			

## REMARKS

OART has reprogrammed \$35,000 to fund this experiment. ✓ The procurement request is in Purchasing Office now. It was not necessary to use locally approved funds to accomplish this. The delay was caused by OART in reprogramming from one kitty to the other. ✓ Kingsbury made the comment that, in the purification of drugs, there are possibilities here that could deliver such things as ultra-pure penicillan. ✓ Apparently the violent reactions that people experience sometimes from penicillan are not caused by penicillan but rather by the impurities in the drug. ✓

CODE DIR	NAME J. T. Shepherd	DATE 3-28-69
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B<sub>2/15</sub>

MISSION:

S-II-7 - Completion of engine systems leak and functional checkout has been delayed somewhat by a requirement to x-ray fifty-eight stage electrical connectors but this is not expected to impact removal of the stage from the stand, still scheduled for 3/13/69. ✓

S-IC-9 - Static firing is still set for 2/19/69, and no impact is foreseen at this date. ✓

BOMEX - All five of the Signal Conditioning and Recording Devices (SCARD's) have now been completed and accepted by the Government. The Decommuation unit is scheduled to be completed on 2/14/69. ✓

First report from the ship "Discoverer" dispatched while the ship was en route to its drift station for the Atlantic Tradewinds Experiment (ATEX), indicated the SCARD installed aboard the vessel had been operational 24 hours per day since departure from Miami on 2/28/69. ✓

We have been asked by ESSA to assist in the design, development, and fabrication of the BLIP (Boundary Layer Instrumentation Package), which is to be fastened to the large balloons tethered to the ships to pick up and transmit meteorological data. ESSA has the funds available for component procurement, and OSSA has indicated their concurrence provided to additional funding is required from them. We have requested permission from Gen. O'Connor to proceed.

The NASA BOMEX Advisory Group will meet at MTF on 2/19/69 and 2/20/69. ✓

INSTALLATION:

Edgewood Arsenal Procurement Action - A Military Interdepartmental Purchase Request (MIPR) has been received from the Commanding Officer, Edgewood Arsenal, in the amount of \$99,543.00, for a six-month study on the "Hazards of Pyro-technics, "Explosive Safety", to be performed by contract with GE-MTSD. This study was approved by Dr. Mueller by letter dated 1/9/69. ✓

B 2/15

LM-A MOCKUP STATUS: We observed the status of the mockup at Grumman this week. A reconfigured crew provision stowage module has been fabricated and placed on the LM-A mockup. We are now discussing the desirability of a brief crew walk-through at Grumman in the event that integrated LM/ATM crew review is not required at MSFC. Some costs and time savings are possible if shipment of the mockup to MSFC is not required.

PLUME DEFLECTOR TESTING: The current plume deflector 1/4 scale model tests in the Grumman shock tunnel were completed last week. Subsequent testing, although originally planned, may not be required due to the highly satisfactory test results indicated by the "quick look" data. Heating rates on the solar array are somewhat below the specified level of 300/btu/hr/sq. ft. ✓

NEUTRAL BUOYANCY TESTS ON ATM TRANSLATION: Neutral buoyancy tests were run February 5, to determine the performance of the trolley concept for astronaut and film canister translation. The tests showed that translation with the trolley concept is more difficult and time consuming than expected. ✓

HABITABILITY SUPPORT SYSTEM REQUIREMENTS (HSS) AND CONCEPT SELECTION: A review of the status of the data for the HSS Preliminary Requirements Review was held at MDAC. Inputs from Loewy/Snaith have been incorporated, and the rationale for concept selection is almost complete. We will have a dry run of the presentation material at MDAC on February 18. ✓

THERMAL CONTROL SYSTEM: A revised concept of the thermal control system is under review by MSFC and MDAC-WD. This concept would accomplish air circulation in the Workshop by the use of fan clusters, four fans per cluster, in 12-inch ducts. Heaters and filters would be preinstalled in the ducts. Sound abatement would be preinstalled around the fan cluster assembly, thereby saving storage volume in the MDA. Post-landing ventilation fans are continuing satisfactorily in test with the modified shaft and bearings. ✓

ITT LASER SYSTEM: The ITT Laser System is still attractive for use in automatic rendezvous and docking use. AAP cannot afford the system as an active part of our present automatic mode, but we are investigating the cost of including it as a passenger with display to the astronauts for information only. Hardware minimum cost (ITT) will be \$2.5 million plus costs for integration into the LM and MDA. Due to the current budget, we may have to eliminate AAP consideration and urge continuation with SRT funds. ✓



B 2/15

J-2 Engine - The J-2 engine test effort at MSFC and Rocketdyne has produced new data regarding LOX system gain factors\* which may explain the oscillation amplification experienced across the center engine LOX pump on S-II-503. The new data also dictate that the fuel system gain factors be investigated in a similar manner. The recent gain factor data are being fed into the P&VE Laboratory math model for the Saturn V vehicle and conclusive results are expected late this week. ✓

General - The Engine Program Office participated in the University of Syracuse NASA program management study last week. Members of the task team talked with key personnel in the project offices and had considerable discussion at the sub-systems level. The group was well pleased with the depth of information they received. ✓

\* see note below

SUBJECT: Correction of February 10 Notes

My Note of February 10, prematurely associated the new J-2 engine LOX system gain factors with the AS-503 center engine oscillations. The engine testing at MSFC in support of overall vehicle POGO studies, and engine testing at MSFC and Rocketdyne to investigate the AS-503 oscillations, proved the LOX system gain factors established several years ago with pump tests were in error. The previous effort also indicated the LOX and fuel system gains were similar, therefore the new data also requires the earlier fuel system work be checked. The new gain factor data generated at MSFC and Rocketdyne is being used in a math model of AS-504 and AS-503 to check dynamic stability. The results of this effort will not be available this week, however, the P&VE Laboratory expects to be able to draw some conclusions early next week. ✓

*Bill Brown*  
W. D. Brown

cc:

PM-DIR, Gen O'Connor/Mr. Hueter.

CODE	NAME	DATE
PM-E-MGR	W. D. Brown	2/12/69

NOTES CONSTAN 2-10-69

B 2/15

Nothing of special significance

B  
2/15

1. HYPERVELOCITY TESTS IN SUPPORT OF JPL: SSL has been conducting hypervelocity impact tests for JPL. Mr. John Howard from JPL visited our hypervelocity lab last week to observe and discuss the hypervelocity impacts of low density particles on insulation material for Mariner "71." SSL's light gas gun range had previously been used to provide JPL with impact data for spheres of 595 and 707 microns in diameter. The question of successful launching of larger diameter (0.16 cm (1/16")) spheres was discussed. It was found that a new method of launch was necessary. After six shots, a successful method was obtained. An outline of 16 shots over a 2-3 month period was proposed. The densities to be tested range from 2.5 to 0.6 gm/cm<sup>3</sup> with a constant diameter of 1/16". ✓

2. WORKING GROUP MEMBERSHIP: Donald P. Hearth of OSSA has appointed Dr. Dan Hale a member of a working group on Exploration Objectives for the Outer Planets. This panel is to make recommendations on planetary exploration programs, particularly to the PSG (Planning Steering Group). ✓



B  
2/15

1. Explorer I Lifetime: Public Affairs Office recently requested information from us about Explorer I, in preparation for a press release for Explorer I's 11th anniversary. Based on our latest available information (January 16th), the satellite was to be in its 51,975th revolution at noon on January 31st. On January 16th, the satellite was in a 324 X 993 km orbit, having a period of 97.9 minutes. Assuming the satellite is tumbling, we estimated that the satellite will reenter about March, 1970. ✓
2. LM-A Unmanned Rendezvous and Stationkeeping: Personnel from Aero-Astroynamics Laboratory and Grumman attended informal meetings at Bethpage, New York recently, to discuss tasks presently being performed in the areas of LM-A unmanned rendezvous and stationkeeping. Typical subjects covered were: LM-A attitudes causing radar heating problems; propellant consumption; terminal rendezvous error analysis; methods of holding a local vertical attitude; real time logic flow; rendezvous radar math model; radar filtering technique; methods of error propagation; and plans for simulating the rendezvous as seen by the astronaut in the MDA. Preliminary reports were obtained on these tasks and key working level contacts were made in the areas of guidance, navigation, and control. Grumman attendees consisted of personnel from the Guidance, Navigation and Control/Analysis and Integration Branch, headed by Rudy Adornato. This branch is part of the Systems Engineering Division for LM-A, managed by Frank Pauly. ✓
3. Wind/Weather Monitoring at HOSC for AS-504: We are working with IO, R-COMP and R-P&VE personnel with regards to monitoring the wind profile conditions (ground and upper level) and weather at KSC for the launch of AS-504. Special emphasis is being placed on typing the lower atmospheric profile configurations, on a real time basis, for use in determining wind loads on the vehicle. More sophisticated means of identifying profile shapes are continuously being researched from the atmospheric theory and statistical approaches. Also, the usual close watch will be carried out on wind and weather conditions during CDDT. ✓
4. Acceptance of Article for the Journal of Geophysical Research (JGR): An article on Diurnal Variations in the 120 to 350 km Region of the Thermosphere, prepared by Mr. D. Weidner and Mr. G. Swenson of our Aerospace Environment Division, has been accepted for publication in the JGR. This article documents measurements and analyses resulting from six thermosphere probes launched for us by the University of Michigan during a 24 hour period at Cape Kennedy. The measurements were made in conjunction with our orbital dynamics and lifetime supporting research efforts. ✓


B  
2/15

1. MAR QUALITY & RELIABILITY ASSURANCE AUDIT OF MSFC: Preparations are being made for the formal debriefing on the MAR Q&RA audit of MSFC which was completed recently. The debriefing is scheduled for February 19, 1969, with General Phillips in attendance. There are approximately 35 findings associated with the Huntsville portion of the audit, which are primarily in the areas of management, in-house Q&RA activities, failure reporting, and configuration management. One recommendation was to extend the metrology operation to include all instrumentation at MSFC in the mandatory recall system. Of course this is desirable, but for many reasons has not been feasible. The action that we plan to take on each finding will be presented at the February 19 meeting. ✓
2. SANDERS DISPLAY SYSTEM PC BOARDS: Computer malfunctions of an intermittent nature, plaguing operations at KSC, are under investigation by this Laboratory. These malfunctions are apparently confined to individual PC boards, and a comprehensive failure analysis is being conducted to localize the failure mechanisms on the individual boards. At the request of I-V-G, approximately ten PC boards which have returned from KSC with confirmed intermittent failures will be analyzed for the purpose of establishing a commonality on several board types. Results to date indicate packaging, design, fabrication, and assembly processes are deficient. These conditions impose a definite potential for "short circuit" failures. Failure analysis on six PC boards have proven high resistance readings due to (1) metallic end cap resistors in contact with etched circuitry, (2) a transistor case in contact with a delay line part, and (3) a resistor lead wire in contact with a delay line part. All of the intermittencies have been identified as failure due to the above conditions. Results of failure analysis on component parts removed from the PC boards include a punched through diode whisker, displaced whiskers, and two failed transistors. ✓



B 2/15

1. ATM RF Transmitter. Subsequent to your letter to Giannini-Voltex, the prototype RF transmitter was received. The unit has been undergoing tests and initially failed while operating at 45° C. The Giannini project engineer found and corrected the problem which was due to a poor solder joint. During subsequent testing, the unit failed at 70° C and was returned to the contractor at the end of last month. Although these specific shortcomings probably can be readily corrected, we will not be surprised if we are plagued with many design and quality problems on this item. We will keep you advised of the progress relative to this problem. ✓
2. American Science and Engineering X-ray Telescope demonstration. The demonstration of the AS&E X-ray telescope which you had planned to attend last month was highly successful. ✓ The demonstration showed the resolution capability of the telescope and the flare detection mode via X-rays. Whenever your schedule permits, the demonstration will be repeated. ✓
3. Visit of Messrs. Culbertson and Forsythe. Messrs. Culbertson and Forsythe came to MSFC last week for informal discussions and visits to various laboratories in connection with the ATM project. Visits were made to the Comp Lab, P&VE, Test, Manufacturing Engineering and the Astrionics Labs to observe the status of hardware, elements and test and simulation facilities. During our visit to P&VE relative to the EVA simulation activities, Phil Culbertson suited-up in the new Litton EVA pressure suit. Both Culbertson and Forsythe expressed their satisfaction with this visit. ✓



Suit

I didn't know we had one here at MSFC.  
If it fits me, I'd like to try it.

B



NOTES

B2/15

NOTES 2-10-69 HEIMBURG

1. S-II: MSFC Program Management approved North American Rockwell's Engineering Change Proposal 6178, which was initiated by R-TEST. This significant change will delete S-II stage insulation leak detection and associated ground support equipment on vehicles S-II-8 and subs. The change should result in a substantial cost avoidance type saving. ✓
2. LAUNCH VEHICLE RESEARCH AND TECHNOLOGY OBJECTIVES (RTO): Write-ups outlining structural research and technology objectives for four programs; the Integral Launch and Recoverable Vehicle, the Space Station, the Low-Cost Launch Vehicle, and the Nuclear Vehicle programs, were completed and presented to NASA/OART personnel on 2-5-69. The write-ups were prepared in a joint effort by our Advanced Studies Office, our Materials and Structures Divisions, and by the Research and Technology Division of R-ME Laboratory, to satisfy the initial NASA/OART requirements for MSFC support in defining the new structures technology task area, Advanced Launch Vehicles and Space Propulsion Stages. ✓
3. MANUFACTURING IN SPACE EFFORT: Since early last fall we, in concert with Bob Lake of Bill Johnson's Office, have been trying to get funds to pursue at least two most interesting possibilities for space manufacturing. These are a unique technique of crystal growth by capture from a solidified ceramic bath (this only works in zero g because the crystals are heavier than the bath and sink and combine in lg), and an ultracentrifuge technique for purification of drugs (a concept of considerable interest to the pharmaceutical industry). The Experiments Office has informed us that again they have been delayed by Headquarters in getting the funds since these are tied to Earth Orbital Space Laboratory funds. We suggest that consideration be given at the local level to free the roughly \$50,000 needed to start this activity. ✓
4. SOLAR ARRAY SYSTEM: The Preliminary Requirements Review for the Solar Array was held last week. Attendance was heavy. Relatively few Review Item Discrepancies were generated. ✓
5. SUPPORTING RESEARCH AND TECHNOLOGY REVIEW WITH HEADQUARTERS: A presentation on the status of OART funded in and out-of-house work on slush hydrogen, capillary liquid control devices and destratification was given to Messrs. Levene, Michele, and Rosche of OART at their request. It appeared that the purpose was to determine which OART group should support the work areas which were presented. ✓
6. SPACE SUIT DEMONSTRATION: A demonstration of two Litton Space Suits - an EVA Constant Volume Soft Suit, and an RX-5 Hard Suit demonstration was held in our Task Analysis Facility in Building 4619 on 2-5-69. Suits were pressurized and representative EVA and lunar surface driving tasks were performed. Mr. Culbertson, AAP Systems Integration, NASA Headquarters had an opportunity to wear the hard suit. ✓
7. AAP MECHANICAL PANEL: A special meeting of the Cochairmen and Co-secretaries took place on 2-5-69. The charter and future intercenter involvements were reviewed. Thirty-six of 41 intercenter (A-level) action items were closed out or reassigned to B-level (intracenter) actions, 23 A-level ICD's were deleted or reassigned to B-level. It was concluded that even though the intercenter activity in certain areas will be reduced, other areas of this panel's responsibility need to be emphasized, e.g. contamination, crew-hardware and experiment interfaces. No basic changes to the charter or panel structure were proposed at this time, and continued intercenter technical coordination thru already established channels is recommended. ✓

OART  
35K

Shep  
Please discuss with Gorman & Nesby. I'm sure we have GEM's full blessing in promoting this kind of work  
B

Shep  
See my remarks on HEIMBURG'S NOTES 2/10/69  
B

Jim Kingsbury reports that EO has received funds & somewhere the Paper work is held up -



B  
2/15

NOTES 2-10-69 HOELZER

LOW-COST COMPUTER GRAPHICS DISPLAYS: On January 22, 1969, Dr. Seitz discussed the low-cost computer display terminals developed in conjunction with the AMTRAN effort with Mr. Kenneth Webster, Chief, ADP Management, Office of Tracking and Data Acquisition, NASA Headquarters. Mr. Webster requested and received information concerning the display units, with additional information for the Technology Utilization Office. On January 29, 1969, Mr. Nellis Adams, Supervisor of the Programming Analysis Group, JPL, called Dr. Seitz to learn more about the low-cost graphics terminals and to see about the possibility of a joint MSFC-JPL effort to develop a "conversational" symbolic manipulation system on the UNIVAC 1108 (for keyboard manipulation of algebraic and applied mathematical formulae). Goddard has such a capability on their IBM equipment but it is unavailable on the 1108's. (Mr. Adams says that JPL is willing to pay for the system but wants technical inputs from MSFC). Two organizations in NASA Headquarters have requested low-cost graphics display units from MSFC. They are represented by Mr. Richard C. Tuey, Assistant for Planning, MSF Program Control, and Mr. Alan Anderson, Project Engineer for the MEDIA System in OART. These matters are being coordinated by the Experiments Office and the Executive Staff. ✓

THIRD GENERATION COMPUTER SYSTEM: The next level of software EXECUTIVE System was placed on the floor in an operational status on January 30, 1969. It was anticipated that several minor unforeseen errors would exist for a short period. However, this level is significantly better in reliability than the previous level of the EXECUTIVE System. Some problems, mostly hardware, have arisen. Compiler errors have been reduced to an acceptable level under this level of the system. Our present knowledge of COmmON Business Oriented Languages (COBOL) indicates a significant reduction in the number of syntax errors logged against COBOL but still may be higher than FORmula TRANslation (FORTRAN). An error count comparison will be given in the next report. All high speed, large capacity drums are configured in and being used under this level. Dual Fastrand drum controllers are in the process of installation. Nearly all remote stations presently active are configured into this system. ✓

1. Deactivation of the S-II Battleship Facility: NR/SD is in the process of deactivation of the S-II Battleship facility to an operational standby condition. It is planned that NR/SD will provide a minimum support (approximately nine men) on site to maintain the facility in a state of readiness to begin testing approximately 30 days after go-ahead. This operational standby condition will be maintained at least through July 31, 1969. At that time the need for the Battleship facility will be re-examined and a decision made to extend the operational standby status or proceed into a more complete state of deactivation. ✓
2. AS-506 KSC Processing: The last stage for AS-506 (the I. U.) is scheduled to be delivered to KSC February 20, 1969. A preliminary working schedule from KSC on 506 has been received and the key milestones are as follows: L/V erection complete March 4; S/C erection complete April 14; Rollout May 19; Launch Ready July 8; and Window Opens July 15. ✓
3. Saturn V Platform Backup in Spacecraft (ref. James Notes 1/27/69): In a special meeting at KSC after the Apollo 8 FRR, Dr. Mueller directed that the effectivity for the platform backup capability be changed to AS-505 and subsequent and that the automatic backup guidance be used only for the S-IC burn with manual control by astronauts used for backup during S-II and S-IVB burns. Our schedule is real marginal on this one, and I will monitor it closely especially in light of the change in IBM management of software development. Jim Meadlock who was handling this area resigned February 6, 1969, to form his own software company. Gordon Doolittle, who was managing IBM's System Design Department, has replaced Meadlock. ✓
4. Dr. Mueller's Visit to NR/Downey on February 3, 1969: Dr. Mueller met with NR top management at Downey last Monday for the same type general discussion he had with MDAC management on January 31, 1969. Bill LaHatte attended the meeting. Dr. Mueller spent considerable time discussing CSM costs and exploring what type of capability NR was developing to respond to launch and flight problems if their subcontractors had gone out of business. NR in covering the S-II cost status presented that they would meet or better the Bogart Task Team cost reduction goal. The only other S-II item which came up concerned the S-II center engine oscillations which was discussed at the 504 Flight Readiness Review and closed out. ✓



*B.d.  
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conversion  
method  
would be  
used?*

Nuclear Technology Review - On February 5-6, 1969, Mr. Carl Schwenk and Mr. Dave Miller, NPO, Headquarters, visited the Center for an informal review of this SRT Program. They indicated interest in a proposal by R-ASTR to use the nuclear rocket engine in essentially an idle mode as an electrical power source for driving amplifiers to achieve good color television for Mars flyby. ASTR pointed out that the Voyager was power limited to about 100 watts. About 10 MW of power would be available, during full operation of the engine, from the core reinforcing rods which are cooled with liquid hydrogen. Running the engine in idle mode would give more than enough electrical power (conversion of thermal power) for the TV transmission. ✓

*B*

Interest was also shown by Schwenk and Miller in neutron and gamma ray detector instrumentation work being done in SSL and the hydrogen reliquifier work being done by Air Products Company for P&VE. They indicated they would like to see the reliquifier developed and experimentally flown so it would be available for possible interplanetary and orbital flights. ✓

The NPO budget estimate for FY-70 was indicated to be at a \$36.5M level, (22.6 for 75k pound thrust (nerva) engine, 8 - SRT, and 1 - Nuclear Rocket Development Station (Nevada Facility), and 4.9 - modify No. 1 Engine Teststand). MSFC Guidelines are expected to be about the same as FY-69 (1.0 M). NPO is talking in terms of a Preliminary Flight Rating Test for the nuclear engine in FY-77. ✓

OMSF Supporting Development Quarterly Review - The review was held at KSC on February 5, 1969. Representatives from the Advanced Manned Missions Office (OMSF) and the three MSF Centers participated. The initial portion of the Review consisted of a report by each Center on the status of their FY-69 Supporting Development Program initiations/obligations, summary of the December MSF Management Council Meeting, announcement of the forthcoming Space Station Symposium at Langley and a brief description of the lunar explorations program plans. The second portion of the review was a discussion of FY-70 Supporting Development Guidelines. Some main points were:

- a. FY-70 and subsequent funding for the J-2S engine is to be provided by the main stream program office rather than by Supporting Development.
- b. Future Supporting Development efforts will be directed primarily towards (1) Space Station, (2) Shuttle, (3) Lunar Base.
- c. The RTOP System devised by OART will be utilized as the primary program submission technique for Supporting Development in FY-70.
- d. It was agreed that there would be a meeting between the Advanced Manned Missions Office (HQ) and representatives of the three Manned Space Flight Centers in about two weeks, to delineate the areas each Center will propose to perform under the new RTOP System beginning with the FY-70 Program planning. ✓

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NOTES 2-10-69 MAUS

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2/15

FY 70 SUPPORTING DEVELOPMENT PROGRAM

We have received from Dr. Mueller, Marshall's guidelines for the FY-1970 MSF Supporting Development Program. It is directed that the FY-1970 program be oriented toward the development of prototype hardware that will support the space station, space shuttle, and lunar base. The J-2S engine development will be moved from Supporting Development into the mainline Apollo Program. Marshall's guideline portion of MSF's 18.3M funding allocation for FY-70 Supporting Development is \$7.0M. ✓

NOTES 2/10/69 MOHLERE

B<sub>2/15</sub>

Negative report.



Implementation of MSF Safety Program Requirements: Dr. Mueller issued an MSF Safety Program Management Instruction on January 16, 1969. A part of this instruction requires each Center to review and evaluate all aspects of the Safety Program at our installations and at the contractor facilities to the extent permitted by law or contract. ✓

Through a coordination effort with IO and R&DO, we now have, or will shortly have, all Saturn prime contractors under contract. The initial proposals for implementation by these contractors were priced at approximately \$1M each. IO has issued one contract change order and is close to completion of the other three prime contractors at no cost to the contract. With this accomplished, we are now planning our first safety survey of a Saturn prime contractor in mid-March and will complete all surveys by May 1, 1969. These plans have been coordinated with Headquarters and we have received assurance that these surveys will replace their previously planned surveys. ✓

B 2/15

GAO ACTIVITY: In addition to the GAO report on "Use of Minor Construction Funding at MSFC," with which you are already familiar, GAO has other investigations in various stages of completion. Of primary importance:

a. GAO contends, in its draft report on "Review of Schedule Incentive Provisions of Boeing S-IC and Douglas S-IVB Contracts" that NASA did not adequately coordinate its planning for the conversion of these contracts with its plans to revise the launch and delivery schedule. GAO claims NASA incurred approximately \$26 million in additional program costs to accelerate delivery. We do not agree with the GAO allegation and are working with NASA Headquarters personnel to develop the Agency response. ✓

b. GAO, in a draft report on "Audit of Boeing S-IC Contract" contends that target costs proposed by Boeing and accepted by NASA for conversion and follow-on modifications were overestimated by about \$4.3 million. GAO recommends that NASA obtain appropriate adjustments for the overstated target costs. A similar GAO review of the F-1 engine contract is underway. GAO contends that Rocketdyne overstated cost, in negotiations, by approximately \$8 million, primarily in materials. Additionally, DCAA has audited the J-2 engine contract and contends that the contract violates Public Law 87-653 (Truth in Pricing). Approximately \$16.5 million has been questioned in the J-2 case. Appropriate MSFC officials are investigating each of these contentions. ✓

c. GAO is continuing their review of Administration and Control of Support Services Contracts at MSFC, and has just begun their survey of RCA (Management Services Office) and Brown Engineering Company (P&VE). ✓

FULL TIME GRADUATE STUDY: We have practically completed all arrangements to pay tuition for Center employees approved for full-time graduate study.

Forty-seven employees are engaged in graduate study at 25 universities throughout the United States. The majority are attending local universities (Univ. of Ala., Tuscaloosa; Univ. of Ala., Huntsville; Auburn Univ; Georgia Tech. Univ.; Univ. of Tennessee). This number of full-time students includes competitive fellowships (Sloan MIT; Sloan Stanford and a Research Fellowship at Univ. of Tennessee Space Institute at Tullahoma, Tennessee). Nineteen are studying at the PhD level. None of these employees except the Sloan Fellows are on per diem. In fact, a few volunteered to pay their own tuition and/or travel because of their cost consciousness and awareness that our budget is inadequate in these times. Tuition costs have nearly doubled in the last five years. ✓

SUMMER EMPLOYMENT PROGRAM: We have received a planning figure of 164 spaces for the 1969 Summer Employment Program from NASA Hdqtrs. This is the same level as last year's program. Our Youth Opportunity Campaign spaces will probably be reduced somewhat from last year's 162 authorization. We plan on making offers on the graduate and faculty part of the summer program beginning around Feb. 15. ✓

NOTES 2/10/69 RICHARD

B<sub>2/15</sub>

Airlock/OWS/System Engineering Contract: The progress in the review of the McDonnell-Douglas contract has not been satisfactory to date despite an intensive effort within the Center. Manpower loading appears far higher than required for the overall job as we see it; and more review time than is available is required to reduce this rationally to an acceptable level. The original submission by the contractor was completely unacceptable as far as the system engineering aspects, and a new submission was requested. This has come in today (Monday) and appears to be greatly improved; however, considerable review is required during this week. If we are not satisfied with the progress of this review as of Wednesday, we will request a delay in negotiation. ✓



1. ATM Gimbal and Roll Ring Manufacturing Review: Personnel from ME, ASTR, QUAL, P&VE, and the Perkin-Elmer Company visited the Fansteel and Western Gear Companies in Los Angeles this week, who are building the ATM gimbal and roll rings from 6061-T6 Aluminum. Problems are being encountered in holding tolerances of the gimbal ring as configured owing to weld shrinkage and repairs. Following the suggestions that were offered, a plan was initiated to redimension the gimbal ring and mating components which will allow the rings in process to be salvaged and subsequent rings to be manufactured with less difficulty. Additionally, we recommended changes in heat treat procedures to reduce residual stresses, changes in clamping procedures during welding to control weld shrinkage, addition of lightening and/or cleanout holes in the gimbal ring to permit chip removal, changes in X-ray quality requirements and repair procedures, changes to the oxide treatment procedure to include an anodize treatment on the gimbal ring in addition to the electrolytic anodizing, and considerations of using the vibratory type stress relief treatment to minimize changes in dimension after machining. Our recommendations are being coordinated with ASTR. We believe that, with the recommendations and changes as discussed above, the gimbal and roll rings can be fabricated without additional delay. ✓

2. Neutral Buoyancy Activities: Arrangements have been completed for astronaut participation in pressure suited, neutral buoyancy tests at MSFC. Two astronauts have been scheduled for the first such test on February 18, 1969. The astronauts will evaluate the "trolley" and "parallel rails" concepts for translating over the ATM. ✓

3. MDA: The structural test article was returned Thursday from R-QUAL and work is underway to install strain gages in preparation for the structural tests. ✓

1. Apollo 9 Mission Support Reviews: NASA Headquarters (Stevenson's office) held a review at KSC, 2/5/69, on all NASA and DOD support systems (tracking, telemetry, communications, meteorology, photography, and data handling) committed to the Apollo 9 mission. This was followed by DOD's pre-mission review with all support forces at ETR on 2/7/69. We can expect the usual good support to the L/V as experienced on prior missions. Our proposal to utilize Apollo Range Instrumentation Aircraft (ARIA) instead of Grand Turk for the coverage of the alternate mission second burn has been accepted and should result in cost savings. ✓
2. Apollo 9 Launch Support: In a surprise move KSC has reduced the request for MSFC on-site launch support from approximately ten to two personnel. Due to illness, only one engineer can be sent down. This was accepted. All other support will be given from the HOSC. ✓
3. HOSC Realtime Flight Support for Apollo 9: In response to Chris Kraft's request we are again preparing some real time support to the Mission Control Center from the HOSC. The AERO Trajectory Team will generate key times related to the two S-IVB restarts. ✓

B 2/15

1. ROCKET CITY ASTRONOMICAL ASSOCIATION CONTRACTS: After a long time of planning and negotiating, and with much help from Mr. Gorman, Purchasing Office, Chief Counsel, and Training Branch, we now have two contracts, <sup>as of 2-6-69</sup> firmed up between MSFC and RCAA. The first provides MSFC a total of 50 observing nights per year at the observatory for \$150.00 each night; the second concerns a lecture course on optics and astronomy, to be taught by RCAA members, for MSFC employees, at \$80.00 per student. Lectures will begin March 4. ✓

2. IMPROVEMENT OF MSFC's SCIENTIFIC IMAGE: A meeting on this subject was held between P. Styles, B. Slattery, A. Sanderson, W. Lucas, and E. Stuhlinger. We concentrated on such problems as high grades (GS-15, and possibly 16) for outstanding scientists, even without managerial functions; possibilities of traveling to symposia without giving presentations; attracting senior scientists to positions at MSFC; maintaining, and even creating, a "core of competence" at MSFC; and establishing and identifying a number of "science teams" in the MSFC Laboratories which will represent efficient groups in the pursuit of well-defined objectives in science and advanced technology. I am preparing a more detailed report on the last subject, and I would like to present it to the Board in the near future. ✓

E.S.

Please do

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3. SCIENCE MEETINGS AT MSFC: A three day "workshop" symposium on optical technology, initiated jointly by OART and OSSA and to be hosted by MSFC, will be held here on April 29, 30, and May 1.

There is a good probability that the next meeting of the Solar Physics Subcommittee of the Space Sciences Steering Committee will be held at MSFC in May. ✓



B 2/15

NOTES - WILLIAMS - 2/10/69

1. Earth Orbital Program: A working group has been convened at Wallops Island, Virginia, by OSSA, to formulate objectives, operational requirements and management plan for the next major stellar astronomy spacecraft (beyond OAO). This spacecraft has been given the name ASTRA (Astronomical Space Telescope Research Assembly). The working group is composed of members from Langley, OSSA, MSC, GSFC, MSFC and Princeton University. The MSFC member is Mr. Jim Downey. ✓

Mr. Olivier (ASO) was invited to attend the working group meetings on Feb. 4 & 5 and to present results of the ATM Follow-on Study. Most of the questions and comments centered around man's role in maintenance, servicing, instrument updating, and as a space base observer. The group wanted to know if man was found to be necessary, what he added to the mission in terms of added capability (scientific), flexibility or improved reliability. Study results showed that man could provide a definite improvement in the probability of mission success, and it indicated that mission flexibility can be provided through changing and updating various sensor elements or instruments. F.W. *extends useful life of all space observatories tremendously*

2. Dual Mode Lunar Roving Vehicle (LRV): The request to negotiate has been signed by C. Mathews. We have been informed that Dr. Newell will probably sign the week of Feb. 9. We are planning to negotiate the week of Feb. 16. B

A meeting is scheduled Feb. 12 in Flagstaff, Arizona at United States Geological Survey to select a base line Lunar traverse. Also to be discussed is the Lunar Roving Vehicle Science. Mr. W. Perry will chair these meetings. ✓

3. Integral Launch & Reentry Vehicle (ILRV): The four contracts have been signed. The contracts are: (a) GD/C (MSFC), \$300K, Flyback and Expendable Trades with Lifting S/C; (b) Lockheed (MSFC), \$300K, One-and-One-Half Stage Concept; (c) NAR (MSC), \$300K, Expendable L/V with Reusable S/C; (d) MDC (LaRC), \$300K, Selected Concepts Covering Entire Spectrum. ✓

Orientation of MSFC contractors will be Feb. 14 with GD/C and Feb. 17 with Lockheed. Formal orientation for both contractors will be Feb. 18. ✓

4. Other Procurement Actions Status: All FY67 funded actions have been completed. The request for Determination & Findings for the Nuclear Propulsion Flight System Definition Study was sent to Hdqrs. Jan. 20. Estimate approval Feb. 15 (optimistic). ✓

Feb 17, 1969

GEORGE C. MARSHALL SPACE FLIGHT CENTER  
HUNTSVILLE, ALABAMA

## Memorandum

TO Mr. Shepherd, DIR

DATE MAR 24 1969

FROM Deputy Director, Operations, Science & Engineering, S&E-DIR

SUBJECT NOTES 2-17-69-GRAU

You recently gave me the attached to run down with respect to Dr. von Braun's note. Unfortunately, Dieter Grau's NOTES left the wrong impression -- that we did not have plans for the people on the West Coast who would become available in August.

The present QUAL in-house requirements can easily absorb several times over the West Coast personnel who become available. The area of largest need is the AAP. QUAL has not been able to apply effort in the past, that should have been, in support of this program and prepare for requirements that will be on us in the near future.

In addition, Charlie Brooks has been assigned as Chief of the Systems Design Verification Division in CSE, which will draw personnel out of QUAL that we will be hard pressed to replace.

The majority of these people fall into the Quality Control Specialist category and it is doubtful that any organization other than QUAL can properly utilize them. However, once reorganization begins, consistent with our overall requirements, people qualified in other disciplinary areas will be given every consideration along with the requirements of QUAL.

  
R. W. Cook

1 Enc:  
Subject Notes

cc:  
S&E-QUAL-DIR, Mr. Grau





# OFFICE OF DIRECTOR - MSFC

CODE	NAME	INIT.	<input type="checkbox"/> ACTION	<input type="checkbox"/> INFORMATION

## REMARKS

PARTIAL SET OF COMMENTED NOTES.

REMAINDER WILL BE DISTRIBUTED WHEN

DR. VON BRAUN HAS READ THEM.

CODE	NAME	DATE

NOTES 2/17/69 BALCH

2/18/69

B.  
2/20

MISSION:

S-II-7 - All work is on schedule to meet scheduled off-stand date of 3/13/69. ✓

S-II-8 - Stage is expected to arrive at MTF on 2/24/69 and to be installed in the A-2 Test Stand on 2/26/69. ✓

S-IC-9 - No constraint is foreseen to RP-1 loading on 2/18/69 and static on 2/19/69, as scheduled. ✓

BOMEX - Preparations are being completed for the NASA BOMEX Advisory Group meeting at MTF on 2/19/69 and 2/20/69. ✓

INSTALLATION:

University Research - Louisiana State University has received notification from the office of University Affairs, NASA Headquarters, of the award of contract for four candidate tasks from MSFC. It is expected that Mississippi State University candidate tasks will be awarded this week. ✓

GENERAL:

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Legal Affairs - During the course of investigating claims resulting from static firings at MTF, information was obtained indicating that various members of the Leetown Community (approximately 9 to 11 miles due north of the S-IC Test Stand) are circulating for signatures petitions to Senator Stennis requesting that MTF static tests be stopped or that much stricter safety criteria be utilized. ✓

Public Affairs - Mississippi Governor John Bell Williams and officials of the State Agricultural and Industrial Board visited MTF on 2/13/69. I spent about four hours with him and his party discussing our various activities and accompanying them on a tour of the site. ✓

Mr. David Schoumacher, CBS News Correspondent, and Miss Joan Richmond, CBS News Researcher, with a camera crew, were at MTF on 2/11/69. They filmed various scenes on site but I understand they did not conduct any interviews with MTF personnel. They filmed scenes and also conducted interviews with officials in at least two communities in the MTF area. ✓

2/18/69

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2/20

COMMAND SERVICE MODULE PDR: The CSM Preliminary Design Review (PDR) was held this week at North American Rockwell Space Division\*. Support for this review by MSFC personnel was provided in the several review teams and the pre-board and board meetings. The primary interest of MSFC concerned the CSM interface requirements with other cluster modules. ✓

SIMULATING TESTING ACTIVITY: All neutral buoyancy tests have been identified. A meeting is set with Mr. Palaoro (P&VE) for February 18, to discuss these simulation activities and interfaces with other NASA Centers. Astronaut visits for simulation testing of the LM/ATM Translator Assembly, Trolley Concept, and Parallel Rails Concept in the neutral buoyancy simulator are currently planned to start on February 24. ✓

APOLLO LM HARDWARE AND EQUIPMENT: As a followup to a co-signed letter we received last week from Bill Schneider and General Phillips, concerning the transfer of Apollo LM hardware and equipment to AAP, we met with several individuals in the Apollo, AAP and Contracting offices at MSC. All parties agreed that a joint recommendation from the Grumman Apollo and AAP offices is required to expedite the turnover of equipment. Accordingly, we are requesting this joint sign-off from Grumman. Turnover of this equipment on a timely basis is vital to keeping the LM-A project on schedule. ✓

ATM FOLLOW-ON STUDY: Final presentation of the ATM Follow-on Study results is scheduled for February 19, at NASA Headquarters. It will cover results of the last nine months' effort with OMSF and OSSA personnel attending. This study represents a significant input to future manned astronomy missions. ✓

ACS CONTROL ELECTRONICS IN AIRLOCK MODULE: A meeting was held on February 10-11, with MDAC-ED, to discuss the details of installing the Attitude Control System control electronics on the Airlock Module. The groundrules were established that will allow MDAC-ED to deliver an ECP for this effort by March 21, 1969. Three studies were identified that need to be worked in parallel with the proposal. ✓

AIRLOCK MODULE/MULTIPLE DOCKING ADAPTER STRUCTURAL TEST STATUS: There are three major problems that cannot be resolved in sufficient time to prevent a minimum of a two-month slip from March 1 to May 1, in the start of the setup of the AM/MDA structural test. These are: (a) The cylindrical sections of the payload shroud required for the test will not be ready until approximately May 1; (b) Final design and launch requirements have not been established for the AM or MDA in several key areas; and (c) Test requirements can only be established when (b) above has been resolved. Lab and project efforts are underway to resolve both the design and test requirements prior to the May 1 delivery of the payload shroud test cylinders. ✓

\* Detailed CSM PDR Note to DIR, <sup>S+E</sup>X-DIR, and PM-DIR only.



NOTES 2-17-69 BROWN

2/18/69

B  
2/20

F-1 ENGINE - During acceptance testing of engine F-6089, one of the thrust O.K. pressure switches actuated below the required level of 1000 psig. This unit was replaced. However, the actuation pressure of the new switch was above the 1090 psig maximum allowable. Both switches were cross-sectioned for detailed failure analysis. Surface corrosion of a chloride-type was found on the "U" frame of the switch. The "U" frames in these switches have been identified with one lot of material and manufactured at the same time as ten other "U" frames. Corrosion of this type has not been found in other switches. Prime suspect for the cause of the problem is in the manufacturing, cleaning, flushing, and drying process of these twelve items. This is currently being investigated. No engine impact is anticipated on AS-504 because no switches from the bad lot were used on AS-504 engines. ✓

J-2 ENGINE - Reference my buck slip to you on 2/12/69 concerning the AS-503 oscillations and the MSFC POGO studies. The math model dynamic stability check expected early this week is not yet available because of computer problems.

Rocketdyne's test program to investigate the LOX system transfer functions is progressing. The test program includes pressure pulses of 20 to 35 psi at 4 to 35 cps into the suction side of the pump while varying the P.U. valve setting and NPSH. Testing with the standard Rocketdyne facility inlet duct is now complete and tests with the S-II stage center engine duct should be completed next week. Data reduction and analysis of the data from these tests will extend into April. ✓

CONSTAN NOTES 2/17/69

2/18/69

B 2/20

Visitors

Dr. Wehstedt, Ambassador from Germany, accompanied by Franz Josep Meurer, German Consul, visited the Michoud Assembly Facility Tuesday, February 11, 1969. The visitors were given a briefing by Mr. James Stamy, which was followed by a tour of the facility. ✓

2/18/75

B 2/20

1. GRAZING INCIDENCE X-RAY OPTICS: In my Notes of 2-3-69, I mentioned the need for additional technological advances in X-ray optics. In response to these Notes, you asked if we had any specific suggestions. The main concern is that we may be overly ambitious in planning a stellar X-ray telescope of 1000 cm<sup>2</sup> collecting area for flight in 1975. The groups in NASA that are involved in grazing incidence X-ray optics work are well aware of the problem. OSSA is in the process of assessing and establishing technological requirements. Mr. Stan Fields and Mr. John Reynolds of the Space Thermophysics Division of SSL are working closely with Mr. Taylor's group in Astrionics on various aspects of grazing incidence X-ray technology. I understand that a meeting is planned with you prior to your forthcoming trip to AS&E, and a major topic of discussion at this meeting will be the grazing incidence X-ray effort. I can supply no specific suggestions. Persons involved in the planning must address two questions, in my opinion:

- a. How large should the X-ray telescope of 1975 be?
- b. What specific technological tasks are required?

These two questions are obviously coupled. ✓

2. EXPERIMENT FOR DELTA: The Experiments Office has asked us to investigate the possibility of flying the Phase Change Thermal Radiator experiment on a Delta mission. This radiator experiment is a part of experiment T-005, proposed originally for flight on the Workshop. However, the radiator experiment portion of T-005 does not require man attendance and, therefore, would be practical to consider for a Delta mission. The thermal capacity of the phase change radiator is greatly enhanced over a radiator in which no change of state is involved. In this particular radiator, solid-to-liquid and liquid-to-solid changes of state occur. The experiment will observe the thermal characteristics of the system as the changes of state occur under null gravity conditions. ✓

3. MACHINE SHOP: The spur machine shop which ME is operating in Building 4481 has been a great asset to SSL research activities. ME is in the process of expanding this shop. We appreciate ME's cooperation in providing this manufacturing support. ✓



NOTES 2/17/69 GEISSLER

2/18/69

B  
2/20

1. AS-505 F Operational Trajectory: May and June targeting data and nominal presettings for AS-505 (F mission) have been supplied to Astrionics. MSC is now considering biasing the TLI cutoff velocity by adding a 7 fps overspeed to facilitate a more acceptable evasive maneuver. An overspeed will necessitate a spacecraft midcourse correction in a retro attitude which is more favorable for communications. We are now waiting for an official request. This, of course, will require a new operational trajectory. Guidance logic is being used to issue the command for the open loop PU step during S-II burn. The way this is implemented it results in an approximate 1.5 deg nose up transient when IGM is introduced during S-IVB first burn. Under a 3 sigma maximum performance case this transient can be as much as 7 deg nose up. ✓

2. Lunar Apollo 8 Science Advisory Team Meeting: Mr. O. H. Vaughan, of our Aerospace Environment Division, attended subject meeting recently at MSC, and participated as a member of the Lunar Operations Working Group. Dr. Charles Lundquist, of the Smithsonian Astrophysical Observatory, showed some of the pictures of the S-IVB ignition, and later the blow-down of propellants, taken by the Baker Nunn Satellite Tracking Cameras. The chairman of the Lunar Operations Working Group requested Mr. Vaughan to prepare a write-up for inclusion in the Apollo 8 Mission Science Report. ✓ The write-up is to describe the tracking photography, phenomena associated with propellant blow-down, and provide correlation of the tracking photography with S-IVB operational events. ✓ Personnel from I-MO, as well as members of Aero-Astro dynamics Laboratory, are assisting in the analysis. ✓

3. Atmospheric Data to the Atomic Energy Commission (AEC): We are providing a limited amount of lower and upper atmospheric data, acquired at KSC, and our pertinent atmospheric study results, to the AEC, Germantown, Maryland. The AEC personnel are using these data in a program which predicts concentrations of radioactivity in the atmosphere in the event a SNAP-27 fuel capsule (attached to LM) were to become ruptured during operation, or during launch of the Apollo Saturn. ✓

EF  
I've seen this  
Very impressive  
B



A&TS Action to Newly

Info. Copy 501

NOTES 2-17-69 GRAU

2/18/69

B 2/20

1. WEST COAST QUALITY & RELIABILITY OPERATIONS: We have evaluated our West Coast Quality and Reliability MSFC manpower resources (approximately 97 including S-II Program Management Inspectors) with respect to current planned workload. Although some minor reductions can presently be made, significant reductions can begin in the August time period under the assumption that the program progresses according to present schedules. We are making plans for the relocation of some of these people into other areas where the need develops. ✓

Show  
I think these  
guys ought to  
get an  
opportunity of  
new

2. VENDOR HARDWARE FAILURE PROBLEMS: While personnel of this Laboratory were on the West Coast recently, Mr. Bauer (MDAC) expressed concern about the long time period required to close out a failure. This has been of concern to us for a long time since a stage sitting on the pad could be affected while the cause of a previous failure has not been determined. Our efforts to speed the system up have met with only partial success. Mr. Bauer, whose attention we are getting now, indicated that a large majority of failures occur on vendor items (which we have experienced also) and that Douglas has a policy of returning failed hardware to the vendor for analysis. This policy may lead to undue cost, untimely results, and biased conclusions. Mr. Bauer is considering the possibility of revising the policy. We will assess the problem at our other prime contractors for any possible improvement of the situation. ✓

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3. BOEING/MAF QUALITY AND RELIABILITY SURVEY: A quality and reliability survey was conducted at The Boeing Company/MAF, January 27 through February 7, 1969. The discrepancies found during the survey were considered, for the greater part, to be minor and not a serious impairment to the satisfactory implementation of quality into the product. ✓

1969 MAR 5 AM 1 23

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3/25 1. Mr. Stuhlinger  
2. Belew  
3. M. H. H.  
By. H. H.  
3/25

NOTES 2/17/69 HAEUSSERMANN

2/18/69

1. ATM Hydrogen Alpha Telescope Cross Hairs. Reference Notes 12/9/68 Haeussermann - discussed this problem relative to the use of mechanical cross hairs or electronically produced cross hairs. Based on the Perkin-Elmer impacts (approximately \$230,000 based on a January 1 go-ahead and schedule slip of 7 months) to add mechanical cross hairs, the MSFC decision was not to make this addition to the present system. Dr. Tousey of NRL was very disappointed with this decision and there have been several discussions with Mr. Belew and Dr. Stuhlinger on this subject. Dr. Tousey's concern is how stable are the electronically generated cross hairs. We have written a test procedure to determine the effects of all the known variables (temperature, voltage and magnetic fields) which may introduce an unstable image relative to the cross hairs. The procedure will be given to Dr. Tousey this week and testing will begin next week. Dr. Tousey and his colleagues plan to participate in the test program. ✓

W. H.  
I understand  
that Tousey is  
happy now, is  
that correct?  
B

2. ATM Critical Design Reviews. Critical design reviews are being held on each of the ATM components (black boxes) or major structural elements. Recent items which have been reviewed are the tape recorder, telemetry signal conditioning racks, Mod II switch selector and the EBW (exploding bridge wire). ✓

3. ATM Mission. Recent actions which have been recently accepted by NASA Headquarters are:

a. Acceptance of the MSFC proposal for continued operation of the ATM to get engineering and Harvard College Observatory scientific data subsequent to the completion of the 56 day manned mission period. Details of the MSFN ground support operations have to be worked out for the unmanned operation. ✓

b. Use of the High Altitude Observatory coronagraph for lunar libration point observation. ✓

The programmatic aspects of incorporating a radio burst noise monitor on ATM is being worked with IO/SAA. This item would provide the astronaut information relative to the formation of a flare. Dr. Owen Garriott has initiated the incorporation of the monitor. The Principal Investigators have expressed a neutral attitude with respect to the merits of the item. The impact to the ATM rack design and schedule would be quite severe if this item were to be incorporated. ✓



2/18/69

B. 2/25

1. S-II POGO ANALYSES: The analytically predicted J-2 engine fuel and lox transfer functions originally developed by NR/Rocketdyne were found to be in error. These transfer functions have been revised by R-P&VE and are presently being used in AS-504 S-II stage stability analyses. S-II stage stability analyses are being conducted inhouse by R-ASTR and R-P&VE, and the stage contractor NR/SD. In addition, TRW Systems and The Martin Company/Denver are conducting independent POGO stability analyses of the AS-504 during S-II powered flight. All study participants are working to a schedule of 2-20-69 for stability results. The results will be presented to General S. Phillips on 2-24-69. ✓
2. J-2 ENGINE S-II-503 ENGINE OSCILLATIONS: Investigation of the S-II Engine 5 oscillations has continued to indicate that increased lox pump inlet pressure will tend to suppress the tendency for high amplitude oscillations. More detailed examination of S-IVB-502 flight data has revealed low level (less than 10 psi p-p) oscillations in chamber pressure during a period of time when lox NPSH was in a range where self generated oscillations were excited in an S-IVB static test. Neither the oscillation amplitude nor the NPSH at which the oscillations were excited fit the S-II-503 characteristics, but were rather similar to static test results. Present effort is concentrated toward supplying revised transfer functions for the S-II-504 POGO analysis. Pump testing at Rocketdyne will be complete in approximately two weeks. Pump pulse testing at MSFC will be delayed to modify the pulsing system, since adequate pulse amplitudes could not be obtained with the present test set-up. ✓
3. AAP/BIO MEDICAL EXPERIMENTS STATUS: (a) Present plans call for an MDA Form, Fit and Function (FFF) test at St. Louis in July of 1970, and also an Equipment Verification Test at SACTO in May of 1970. We cannot meet these dates with full fledged flight hardware. We are working this problem with I-S/AA. (b) We understand that General Humphreys plans a meeting on Biomed on or about 2-25-69, to assess the full implications of the McDonnell Douglas Aircraft Company FFF and the SACTO Equipment Verification Test, as well as other schedule incompatibilities. We are preparing our information on the subject in conjunction with the Medical Directorate at MSC - this will insure solidarity. (c) It now appears that no funding will be forthcoming from MSC on Experiment M052 (involves urine measurement and sampling). This probably means that MSFC will have to pick up the M052 requirements and incorporate them in the Habitability Support System (HSS). We are continuing to work with the Medical Directorate to insure that their requirements will be reflected in the HSS. ✓
4. NEW S-IC ACTUATORS: Although unqualified non-stress corrosion susceptible actuators are available for S-IC-6 in April 1969, the Level III Configuration Control Board changed the effectivity for installation to S-IC-7. Qualification is scheduled for completion in May, and S-IC-6 is scheduled to fly in July 1969. The actuators on S-IC-6 are from the same lots as S-IC-3 through S-IC-5, which makes them about two months older than S-IC-5 at launch. Stress corrosion has occurred on S-IC-6, S-IC-7, and S-IC-8 in structural components for the first time, although the same components have been on previous stages. Since chances of stress corrosion cracks increase with age, we recommend a change to the new actuators on S-IC-6 to preclude the possibility of a cracked actuator and resulting mission loss. We have forwarded our recommendation to Lee James. ✓

→ LB James o.k. 2  
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2/25

NOTES 2-17-69 HOELZER

2/29/69

Nothing of significance to report.



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2/25

2/18/69  
1. S-II POGO (Suspected): Since no one from the Director's office was able to attend the P&VE summation, conducted on February 10, of their studies on the AS-503 S-II engine pump oscillation and the suspected S-II POGO, I will summarize our current status. Early February analysis of Rocketdyne and MSFC pump tests revealed that the model used in our stability analyses was in error by two orders of magnitude at 18 hertz; less at lower frequencies. (The corresponding error in the F-1 analysis was a factor of about 1.8 at 5 hertz.) A new transfer function has been defined and several stability runs accomplished in Comp Lab using the Boeing Company upper body model for AS-504 including the new tank pressure and crossbeam frequencies. Runs on both AS-503 and AS-504 are showing instabilities at +0 to 30 db at about 16 to 25 hertz at time points where propulsion modes and structural frequency are widely separated. Two Martin specialists arrived February 13 and are assisting MSFC in a thorough reexamination of our inputs and results. North American is conducting a parallel study with similar results. TRW is also working independently on the problem and MSF is putting Boeing TIE to work on it. Our results are preliminary and not firm at this time. We hope to make better progress this week. We and North American are considering several possible fixes, but incorporation of any on the present schedule appears doubtful. We plan POGO working group meetings to develop recommendations by February 20. McDonnell Douglas is making an analysis for S-IVB. MSFC has not worked S-IVB. We will keep you informed. ✓

121  
What is  
the final  
conclusion?  
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2. S-IC Control Structure Dynamics Instability: The control stability of AS-504 using the 3-D couple elastic body model shows a potential instability in pitch at 8 Hz at the end of the S-IC stage burn from about 154 to 160 seconds in flight. The alleged cause is amplification of the sensed attitude rate in pitch by a factor of 10 to 15 due to local deformation of the IU during pronounced spacecraft motions in combination with the S-IC tank and tail deflection near propellant depletion. We highly question the validity of the 3-D coupled elastic body data in the IU region, and results of investigations presently being performed are expected within 2 to 3 days. If, however, the bending data proves to be valid, control instability of AS-504, rate gyro saturation and structural failure near cutoff of the S-IC stage are highly probable. The complexity of the fixes available would probably result in a schedule impact if implemented. ✓

3. S-II Insulation (reference James' notes 2/3/69): The structural qualification portion of the insulation test program (cork-over-honeycomb) was successfully completed February 7. Additional backup testing such as environmental tolerance, cryogenic with aero heating, vibration and chem-seal, is being performed. These additional tests are to be completed approximately April 1, 1969. ✓



NOTES 2/17/69 JOHNSON

2/18 JVS

B<sub>2/25</sub>

Nothing of significance to report.

NOTES MAUS 2/17/69

2/18 955

B 2/25

Nothing of significance to report.

NOTES 2/17/69 MOHLERE

2/18 JS

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2/25

Negative report.



2/18/69

B 2/25

SNAP-27/ALSEP Safety Review:

As you recall, General Phillips scheduled a presentation on SNAP-27 for the March Management Council Meeting (MCM). During Phillips' short discussion on this subject, Dr. Debus questioned whether all of the outstanding problems would be resolved prior to the meeting. KSC has expressed concern over the method of testing for shrapnel damage that has been previously accomplished on the fuel casks. As a result of this concern, General Phillips appointed a small committee to provide additional test data to answer these questions and others that were raised at the last SNAP-27 Safety Evaluation Panel Review Meeting. Mr. Bill Riehl (P&VE) is the MSFC member of this group. He has been assisted by R-AERO and other P&VE people in providing fragment velocity data to the committee. The committee recommended that further tests be conducted immediately under the direction of Sandia Corp., an AEC Contractor for SNAP-27. These tests are being conducted this week and will include hitting the side of the fuel cask at a velocity of 2000 feet per second with a section of 0.063 aluminum-edge on (simulating part of the S-IVB forward dome). In addition, a separate impact test of an IU distributor mounted on a cold plate will be performed.

The test results will be evaluated by the Phillips Committee and presented to the Safety Evaluation Review Panel the week of February 24, The Panel evaluation will be presented in condensed form at the MCM. We have a member on this Panel and will provide you a summary of results prior to the MCM. ✓

NOTES - 2/17/69 - NEWBY

2/18/69

B 2/25

Negative report.

B 2/25

NOTES 2/17/69 RICHARD

Mission Implementation Schedules: Starting with the C' mission, the Saturn V launch rate of one approximately every two months throws us into a Mission Implementation Cycle which is very difficult to meet on our previously established schedule. C' was worked in real time in somewhat Ad Hoc fashion, and the real impact resulted in follow-on missions through 507. We are now revising our mission planning and implementation schedules to be more compatible with the resulting tight launch schedules and our capabilities for supporting these schedules. In essence, this results in a much shorter development cycle on the basis that, for L/V purposes, each lunar mission will be essentially a repeat of the previous one. Control must also be exercised over stage and interstage sequencing changes so that the flight program from one vehicle will be basically compatible with the next vehicle. Examples of work reduction are: (1) one propulsion delivery rather than the present two deliveries, (2) one operational trajectory rather than preliminary and final, (3) efforts at standardizing flight sequences, etc. This problem is being worked closely with Lee James' office. ✓

CSM PDR: The CSM PDR held last week at North American brought out several areas of concern to us from a systems engineering point of view. Some critical interface definitions are not yet established by official intercenter agreement. These will be dealt with in the immediate future by an inhouse MSFC meeting coordinated by the Saturn/Apollo Applications Program, PM-AA. In addition, such problem areas as contamination effects of the CSM on ATM and other MSFC experiments need a unified input from MSFC before the detail design of CSM can proceed in some important areas. Our present assessment of the problem will be given to MSC this week, but further intensive effort, now underway, is required before we can reach agreement with MSE as to the optimum solutions to particular problems. An interesting outcome of the Review Board briefing was the large impact of the decoupled (LM/STM/CSM) mission on the design of the CSM. This is the design case for several systems. ✓

Transposition Docking and LM Ejection (TD&E) for AS-504 (Re: Question by Dr. Rees on MSFC/MSC analyses for this phase of the mission): This information will be submitted separately to you and Dr. Rees. ✓



2/18/69

B 2/25

1. KSC Support: It was reported that storage cabinets on the Launch Umbilical Towers at the 60, 100, and 120 foot levels had to be replaced. A contractor had bid \$1,200,000 for building 33 such cabinets. IO asked us for an assessment of this bid. Based on a review of the drawings we considered this bid excessive. Two of our men then went to KSC to inspect the damaged cabinets and recommended repair and refurbishment. This recommendation was accepted by KSC. Only nine cabinets are to be reworked. These, together with raw materials, are now enroute to ME. The reduction in cost resulting from this new approach approximates \$900,000. ✓

2. OWS Solar Panels: We provided to P&VE three solar array panel substrates to which dummy solar cells were bonded in our shops. These panels are to be used for acoustics and vibration tests at Wyle Labs. Subsequently structural tests may also be performed. ✓

3. Neutral Buoyancy Activities:

a. Astronaut participation in neutral buoyancy testing, originally scheduled for February 18, has been changed to February 24 at the request of MSC. Astronauts Weitz and Kerwin have been cited by Houston as the initial test participants and will evaluate two concepts under development for retrieving the ATM film cassettes. ✓

b. Arrangements were made with MSC to obtain an A-5L Apollo suit in order that all suit-system interfaces and safety procedures could be confirmed prior to the February 24 astronaut visit. This suit was received on February 14 and checkout procedures initiated in the Neutral Buoyancy Simulator. ✓

c. Hardware for the ATM film retrieval tasks is currently being installed in the tank. The test procedure for these tasks has been received from P&VE and is being incorporated into the ME Laboratory test plan. ✓

d. Congressman Buchannan and Members of Congressman Teague's Staff visited the Neutral Buoyancy Simulator this week and were given a general test orientation. ✓

M.S.

Would that  
suit fit  
me? I'd  
like to try  
an A-5L

B

NOTES 2/17/69 SPEER

2/18/69

B 2/25

1. AS-504 Countdown Demonstration Test: At 0800 this morning the 504 CDDT was at T - 28 hours and counting. At this point no built-in holds remain and T - 0 is scheduled for 1200 CST. (Original schedule called for T - 0 at 1000 CST with a 6 hr hold built in at T - 9 hr). Causes of lost time were a water-glycol quick disconnect leak on the LM; extended time for LM ordnance hookup; a weather front passage which delayed pad work; and extended time for cryo loading in the CSM. Launch vehicle power up is scheduled at 1130 CST today, MSS removal at 0110 CST tomorrow, and the beginning of launch vehicle cryo load at 0417 tomorrow. ✓
2. Apollo Spacecraft Mission Photography: Arrangements have been made with MSC for the MSFC Photographic Branch (TS-P) to receive selected Spacecraft mission films from each flight. These will be first generation duplicates or optical masters from the onboard 70 mm Hasselblad cameras and 16 mm Maurer motion picture camera, plus selected film of recovery operations. Included will be copies of films made on the lunar surface during landing missions. ✓
3. Missions F and G Planning: At the February 13 MSC Flight Operations Planning Meeting for Missions F and G, MSC strongly favored use of a hybrid rather than free return lunar trajectory on the last day of the July window and all days of the August through December 1969 windows. The primary reasons are to obtain Pacific injections and provide more favorable operations at earth and moon. To insure adequate CSM/S-IVB separation after TLI, MSC is considering biasing the S-IVB second burn cutoff velocity, followed by a SC evasive maneuver 20 minutes after LM extraction. A 3 second SPS burn would then yield a  $\Delta V$  of 21 fps and a separation distance of  $\sim 25,000$  feet at LOX dump. These considerations will be discussed with MSFC at the Guidance and Performance Subpanel meeting on February 18. ✓



NOTES 2-17-69 Stuhlinger

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21/8/69

1. VISIT WITH MSFC SCIENTIFIC CONSULTANT DR. FRIEDMAN, NRL:  
Herb Friedman and I spent several hours discussing the new organization of MSFC, the creation of a "scientific image", and the possible convergence of manned spaceflight and astronomy programs. Herb's views agree closely with those of Dr. Goldberg's Astronomy Missions Board. They can be condensed as follows: Without doubt, man will eventually play a very significant role in orbital astronomy. At the present time, astronomers are planning to design and build large systems (2500 to 5000 kg) for orbital use, among them high energy, solar and stellar instrumentation. For several years, they will have to learn the fundamentals of how to build and operate these systems. Astronomers should not be forced to mortgage, during this learning phase, their payloads with the very demanding extra requirements of inhabitability, which include man-rating, contamination control, pressurizability, long development times, high cost, and large amounts of documentation. We must try to find a scheme of convergence of the man-in-space program and the astronomy-in-space program which is less imposing for the astronomers during the next three to five years. Man's future utility in orbital astronomy is certainly very real, and promising, but to the astronomers the cost of man's availability in orbit must not be greater than his potential usefulness. ✓

BILL  
Lucas  
this is  
very  
true and  
very  
important  
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Jim Downey, who spent a week with the ASTRA Committee, and I, after spending a day with Jesse Mitchell's Astronomy Planning Panel of the PSG, would like to give you a detailed briefing on present astronomy planning. We are arranging for a suitable time with Bonnie. ✓

2. ASTRONOMY PROJECT STUDIES: Harold Glaser, OSSA, is requesting MSFC to consider the possibility of accepting project management for a solar UV satellite experiment involving a 65 cm (26") mirror (Zirin experiment). Jesse Mitchell is requesting MSFC to consider the possibility of accepting responsibility for a project study concerning a heavy (500 kg) payload for high energy astronomy (XUV, X-rays, and gamma rays), manned or unmanned. I'll discuss both these requests with Dr. Lucas. ✓

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2/18/69

B 2/25

1. LUNAR PROGRAM - Negotiations will be held with proposers for the LRV phase B study contract the week of February 16. Ben Milwitzky of the Headquarters Apollo Lunar Exploration Office (MAL) will attend the negotiations and review the FY69 LRV 1122's. It is planned that we obtain resolution on the 1122's from Milwitzky so work statements and procurement actions can be started. ✓

2. EARTH ORBITAL PROGRAM - MSFC participated in the Space Station Technology Symposium held at Langley February 11-13. Dr. Paine opened the meeting; Dr. Mueller and Mr. Mathews emphasized that NASA should take a bold approach to the development of the space station and the supporting logistics systems. Major reduction in the cost of space operations is needed to permit establishment of a "semi-permanent" capability. The program should produce useful and beneficial services for the Nation and should provide support to other Agencies. Mr. Becker presented MSFC Space Station studies and Mr. Williams presented MSFC Logistics Systems Studies. On the third day, Mr. Schneider discussed AAP and MOL, and Air Force Space Logistics Systems Studies were presented by the Air Force. Brig. Gen. Hedrick (Director of Space under USAF Deputy Chief-Staff, R&D) said the Air Force was interested in joint effort/use on logistics, but said that mission requirements should lead to different designs and operations thereby necessitating no significant joint efforts in space stations. Dr. Newell pointed out that MSF is carrying the Agency and that it cannot be justified solely on the basis of science. The basic development of operations and an advanced technological base, exploitable by others, should be the foundation of our arguments. ✓

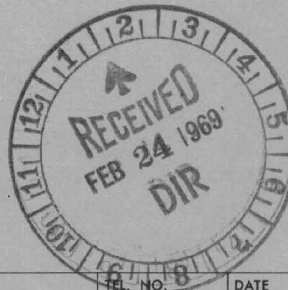
3. INTEGRAL LAUNCH & REENTRY VEHICLE STUDIES - Mr. Akridge of my office will represent MSFC at all of the ILRV formal contractor orientation meetings. These meetings are scheduled as follows: February 18 at MSFC with GD/Convair and Lockheed; February 19 at Langley with McDonnell-Douglas; February 20 at MSC with NAR. ✓

FEB. 24 1969

# ROUTING SLIP

MAIL CODE		NAME	ACTION
			APPROVAL
			CALL ME
	DIR	Dr. von Braun	CONCURRENCE
			FILE
	DEP-T	Dr. Rees	INFORMATION
			INVESTIGATE AND ADVISE
			NOTE AND FORWARD
			NOTE AND RETURN
			PER REQUEST
			PER TELEPHONE CONVERSATION
			RECOMMENDATION
			SEE ME
			SIGNATURE

This is the letter referenced in Notes of 2/24/69, para. 3, subject: Transposition Docking and LM Ejection (TD&E) for AS-504(as per questions by Dr. Rees on MSFC/MSC analyses for this phase of the mission).



MAIL CODE	NAME	FILE NO.	DATE
S&E-SE-DIR	L. G. Richard	3-5100	2/24/69





NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
MANNED SPACECRAFT CENTER  
HOUSTON, TEXAS 77053

*H. Ledford*  
*J. FL. Sy.*  
*Sep.*  
SEP 19 1968

IN REPLY REFER TO: PD5/L624-17.2-68

TO : George C. Marshall Space Flight Center  
Attention: L. B. James, I-V-MGR

FROM : Manager, Apollo Spacecraft Program

SUBJECT: Sequence of events for CSM/SIA separation, docking, and  
IM/SIA separation

Attached is the abstract of the joint MSFC/MSC review of the sequence of events for CSM/SIA separation, docking, and IM/SIA separation. I believe this meeting accomplished the intent of assuring launch vehicle and spacecraft sequence of event compatibility for this mission phase and that further meetings are not indicated.

The provisioning of a spacecraft separation signal to the S-IVB is not considered mandatory as there are ground commands available for the required functions. Our present program position is such that I cannot implement non-mandatory changes. MSC will implement the other action items as indicated in the abstract.

The detailed crew procedures for this mission phase are being extensively reviewed at this time and will be forwarded for your information when a final version is available.

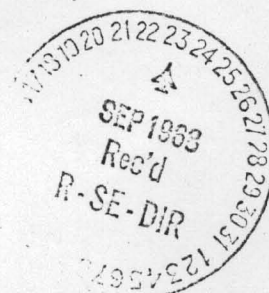
*George M. Low*  
George M. Low 9-19

Enclosure

cc:

MSFC/E. F. M. Rees, DEP-T  
MSFC/L. G. Richards, R-SE-DIR  
MSFC/R. G. Smith, R-SE-P  
MSFC/F. Hammers, R-ASTR-S  
MSFC/P. Hoag, R-AERO-P  
MSFC/F. Swalley, R-P&VE-PP  
MSFC-Houston/J. Hamilton, RL

MSFC/R. E. Beaman, I-V-E  
MSFC/H. Ledford, R-SE-S  
NR/R. K. McClung (c/o CF22)  
NR/C. M. Jones (c/o FC)  
NR/J. R. Potts, AB74  
GAEC/E. L. Keesler (c/o FC4)



## A B S T R A C T

of

### MSFC/MSC JOINT REVIEW OF THE SEQUENCE OF EVENTS FOR CSM/SIA SEPARATION, DOCKING, AND LM/SIA SEPARATION

Enclosure 1 is a preliminary definition of the sequence of events for docking and was utilized as the basis of this review. Enclosure 2 defines current revisions to this sequence.

It was agreed that the existing ICD framework is adequate and that a new ICD will not be defined for this sequence of events. It was noted that the piloting procedure presently defined is dependent on knowledge of the propulsive vent characteristics. MSFC personnel stated that the characteristics cannot be defined as a constant thrust level. J. Potts, NR, stated that the procedures provide pilot options and that the crew will have no problem in controlling the docking maneuver. R. Ward, ASPO, will take appropriate action to assure that the propulsive vent characteristics are adequately documented and available to the flight planning personnel.

The MSFC personnel expressed a desire for a CSM/SIA separation signal on the C' mission and a LM/SIA separation signal on subsequent missions. These signals would be used to program the attitude and delta V maneuver following spacecraft separation. It could also be used to control the control system gain changes for contingency operations for Mission C'. The ASPO will process a Request for Engineering Change Proposal to define the impact of providing this signal to the S-IVB.

It was noted by MSFC personnel that previous reviews have indicated that time critical sequences such as the IM tension tie and umbilical guillotine initiation may have inadequate margins for some failure cases. The ASPO will assure that a failure effects analysis has been accomplished for this area and that adequate margin exists.

Action items assigned are as follows:

R. Ward - Process RECP to define impact of providing a spacecraft separation signal to the S-IVB.

R. Ward - Coordinate with MSFC to assure that the propulsive vent characteristics are adequately documented.

A. Cohen - Review failure effects analysis to assure proper sequencing of the IM tension tie and umbilical guillotine.

Enclosures 2

BALCH 2/24/69 NOTES

2/24 JVS

B  
2/24

S-II-7 - Post-static inspection of the foam insulation revealed debonding condition between the foam and the primer. Subsequent special spray foam tests performed on the stage indicated that the debonding condition was a result of unstable temperature conditions in the vehicle sidewall. Upon completion of post-static checkout scheduled for 3/15/69, stage will be moved from the A-1 Test Stand to the Vertical Checkout Building for completion of insulation work. Shipment to KSC is now scheduled for 4/11/69. ✓

S-II-8 - Stage arrived at Michoud yesterday, 2/23/69 and is scheduled to arrive at MTF late today, 2/24/69, as previously planned. ✓

S-IC-9 - Static firing of stage was successfully performed at approximately 3:17 p.m., 2/19/69, for the planned duration of approximately 125 seconds. Firing was scheduled for 3:00 p.m. So far no anomalies have been disclosed. Plans for replacement of splice angle plates in the forward skirt are presently under consideration. If this work is performed at Michoud as is indicated, stage is expected to be removed from the test stand on 3/17/69 and shipped to Michoud on 3/10/69, as previously planned. ✓

BOMEX - Program is satisfactory. The Global Atmospheric Research Program (GARP) is now receiving the attention of several Government agencies including NASA. ✓

GENERAL:

Public Affairs - Visitors at MTF to view the static firing of the S-IC-9 on 2/19/69 numbered approximately 1200. ✓



2/24 ND

B  
2/26

APOLLO LM HARDWARE FOR AAP: Rip Bolender, the Apollo LM Program Manager at MSC, has agreed to co-sign a request to Grumman that a joint Apollo/AAP list of "GFP" be prepared to permit smooth transition of Apollo LM hardware to AAP. George Low's office has also agreed to work with us on an agreement for transfer of the flight Apollo LM hardware. ✓

IAM STRIKE SETTLEMENT: The International Association of Machinists and MDA C-ED (St. Louis) settled their disagreement and employees returned to work last Monday. The Contracting Officer was notified of the settlement and that a company position on program impact would be forthcoming. No significant impact is expected. ✓

HABITABILITY SUPPORT SYSTEMS: MSFC is continuing to proceed as rapidly as possible in the Habitability Support Systems with MDA C. A preview of the Habitability Support Systems PRR data package was held last week and MDA C-WD will distribute the data package on February 24 and the PRR will be on March 5. ✓

ATM EXPERIMENTS: The thermal mechanical units for NRL-A and NRL-B were accepted by MSFC on February 14, 1969, and shipped from Ball Brothers on February 15. ✓

CLEAN ROOMS FOR ATM: The dollar amount for each of the clean rooms exceeds \$250,000 and they are labeled as facilities; therefore, Congressional committee approval must be obtained. One package to the Congressional committee will be the 4755 clean room and the other the clean room and ACE control room in 4708. The estimated costs of these items are: 4755 clean room (assembly) 300K; 4708 clean room (checkout) 490K; and ACE control room area (checkout) 450K. ✓

GENERAL: Arrangements are underway to meet with top management of our prime contractors on Monday, March 3, 1969, to discuss the critical AAP funding situation. ✓

NOTES 2-24-69 BROWN

2/24/69

B  
2/25

No report.

CONSTAN NOTES 2/24/69

B  
2/26

S-IC-6 The stage departed MAF on Sunday, February 16, 1969 at  
6:30 a.m. This was <sup>2/24 g/s</sup>two days later than the planned departure date. The  
delay was due to high winds and rough seas in the Gulf of Mexico. ✓



2/24/69

B 2/26

1. LUNAR DRILL: Mr. John Bensko relates that Westinghouse has demonstrated exceptional performance in rotary drilling under "dry" conditions. They have obtained depths of approximately 5 meters in very hard basalt without excessive bit wear. This compares with a 7.5 meters capability under "wet" drilling conditions. The Bureau of Mines will conduct performance tests to validate these results. If the tests are repeatable, Mr. Bensko believes that a breakthrough in drilling has been obtained. The ability to do dry rotary drilling should find significant applications; for example, drilling porous formations, drilling in cold climates, or drilling in arid regions where water is not available. (Compressed air can be used for removing chips and cuttings in regions where water is not available. However, compressed air drilling is not satisfactory in certain formations and where power and weight constraints prohibit the use of large compressors.) Mr. Bensko and Mr. Lundy of TEST will follow this progress closely.

2. PAPER PRESENTED AT SOLAR PHYSICS SYMPOSIUM:

Dr. Mona Hagyard of SSL presented the paper, "The Calibration of Solar Magnetograms Obtained with Narrow Band Birefringent Filters," at a special Solar Physics Symposium sponsored by the American Astronomical Society in Pasadena. Dr. Brueckner of NRL co-authored the paper with Dr. Hagyard.

3. HIGH ENERGY ASTRONOMY: GSFC and MSFC are collaborating on a high energy cosmic ray experiment. Dr. Frank McDonald is the lead man at GSFC, and Dr. Tom Parnell is his counterpart at MSFC. SSL has designed and built (in the ME spur shop) a 0.5 meter x 0.5 meter proportional counter which is to be incorporated in the GSFC/MSFC experiment. Dr. McDonald accompanied Dr. Al Schardt of OSSA on a recent visit to MSFC to discuss a high energy astronomy payload which has been recommended to NASA by the Astronomy Missions Board. A cosmic ray experiment would be a part of this payload.

4. BALLOON EXPERIMENTS: Balloon flights of SSL X-ray and gamma-ray experiments are scheduled in March and April, respectively. We are working with NRL on the X-ray flight and with ORNL on the gamma-ray experiment. We are also to take data from our mobile telemetry van for a GSFC balloon flight scheduled for February 26.



2/24/69

B  
2/26

1. LM-A Plume Deflector: As a part of the review of the LM-A General Test Plan, a general inadequacy of the proposed test program for design data of the plume deflector for the LM-A minus X thrusters has been uncovered. The known deficiencies include heat transfer on the deflector and other surfaces, plume definition and performance degradation of the thrusters. These deficiencies notwithstanding GAEC proposes to conduct full scale hot tests with no instrumentation. The so-called Structural/Thermal adequacy test will merely consist of watching the deflector to see if it remains intact. Because of the importance of this problem with regard to available propellants, ATM solar array heat loads, and the critically high temperatures of the deflector itself, it is recommended that the full scale tests include a well instrumented deflector and the additional fractional scale tests be run at MSFC concurrent with the development of a more rigorous theory to describe the plume and add confidence to the test results.
2. AS-504 Stability Problems: Recent stability problems for the AS-504 launch vehicle, e.g., the combined sloshing and 8 Hz lateral bending mode have shown two definite needs in modeling of dynamic systems. First: The lumping of masses, which is necessary to stay within computer limits, has a strong influence on the stability situation. As several modal frequencies are very close to each other, high accuracy in mode shape and frequency is critical. A parametric study is expected to provide enough insight to define an acceptable compromise between faithfulness of simulation and simplicity for economical computer usage. Second: The closed-loop dynamic model used in control and stability analysis has many assumptions that may not be compatible with the detailed high frequency modes generated in the 3-D (three dimensional) analysis. To correct this situation a complete dynamic model should be developed for a 6-D (six dimensional) trajectory and a 3-D elastic vehicle, including nonlinearities. The equations should serve as a base for an orderly simplification to equations for use in stability analysis, etc. Because of manpower limitations, contractor task assignments have been initiated. Availability of funds is a problem not yet solved.
3. Optical Correlation Methods: Our optical correlation (cross-beam) methods are being recognized by the technical community for their potential ability of acquiring detailed measurements, as well as aiding in basic understanding of fundamental phenomena such as turbulence and noise generation. A joint research program with ESSA was recently arranged, entitled: "Exploring potential of infrared crossed-beam techniques for micrometeorological studies of mean winds, water vapor fluxes and turbulence near earth's surface." In addition to the initiation of this intra-agency research program, a combination of research and education programs has been arranged between MSFC and Colorado State University, and the University of Oklahoma. Recently, the University of Alabama and John Hopkins University have expressed interest in this cooperative research and education in this area.

Lee  
Sloan  
Possible?  
B

Lee  
James  
Suggest  
We  
give  
this  
proposal  
very  
serious  
consideration  
in  
order  
to  
avoid  
repetition  
of that

rather embarrassing Flight Readiness  
Review on Apollo 9 (KSC, Feb. 26).  
Your (constructive) comments are invited  
B

NOTES 2-24-69 GRAU

2/24/69

B 2/26

No submission this week.



2/24/69

B 2/26

1. Redshift Relativity Program. Astrionics Laboratory personnel will attend a meeting at NASA Headquarters to discuss the future of the Redshift Relativity Program. One of the significant items to be discussed is the impact of the withdrawal of Dr. Ramsey of Harvard and Dr. Kleppner of MIT as Principal Investigators. The Smithsonian Astronomical Observatory has shown interest in taking over the maser development for space flight application. Any significant results or conclusions of the meeting will be subsequently reported. ✓
2. ATM Control Computer. The prototype ATM control computer and associated test equipment have been received from Bendix. The equipment is presently undergoing bench tests and evaluation in preparation for use in flight simulation of the control system. ✓
3. ATM Clean Room. A meeting with Facility and Design personnel and Mr. Huth was held last week to review our clean room and ACE control room requirements, cost and schedules. The cost of the clean rooms for ME Laboratory and Quality Laboratory has exceeded the \$250,000 limit; therefore, Headquarters has to submit our facility request to a congressional committee for approval. Presently, our construction completion dates are estimated to be one to three months late. Unless these dates can be improved, we will have to slip our checkout on the prototype unit which will impact the flight unit. ✓
4. AAP Funding. In an effort to reduce the ATM cost for FY-69 and FY-70, we are in the process of performing a cost reduction exercise. Areas of documentation, testing and spares are being reviewed to see where some reductions may be made. Present indications are that some slow down of major contractors (Bendix, IBM, LTV) may be required to stay within the presently indicated funding level. This slow down will impact the ATM schedule. ✓

B 2/25

NOTES 2-24-69 HEIMBURG  
2/24/69

1. S-II-6: The center LH<sub>2</sub> feedline will be changed out because of a bellows that has insufficient radii, causing microcracks and then loss of vacuum. This may cause an impact on S-II-6, as the line must be installed in the stacked condition. Lines on S-II-7 and subs will be changed. S-II-4 and S-II-5 are not affected since the process causing the problem was not used on these particular lines. ✓
2. S-II-7 INSULATION: Subsequent to static firing of S-II-7 the spray foam and primer were found to have debonded from the tank wall in all three feedline cavities. These three elbows were spray foamed in the test stand at MTF against our advice. We concluded that the cause of failure was most probably poor primer adhesion and/or improper environmental control for the exothermic chemical reaction of the foam. We and the North American Rockwell (NR) technical personnel recommended that S-II-7 be removed from the test stand and put into the Vertical Checkout Building where better surface preparation and temperature control can be achieved. Negotiations with IO resulted in a 21-day slip in the shipping date of S-II-7 and an agreement to proceed as we recommended. ✓
3. INTERTANK UMBILICALS: Failure analysis testing of the AS-503 intertank umbilical reconnect assembly was completed. The tests were performed to determine the cause for the slow retraction of the unit on AS-503 launch. Examination of the pneumatic system revealed seven loose fitting connections. The fittings were torqued and the retraction times at ambient and cryogenic conditions were again within design specifications. Quality and Reliability Assurance Laboratory has been informed of the above. ✓
4. FLAMMABILITY SPECIFICATION: At a meeting with MSC and Mr. Cohen of Headquarters, to draft a coordinated flammability specification for AAP, there was general agreement to use basically the MSFC-SPEC-101 with some relatively minor modifications. The one major significant development from the meeting was that MSC has used at least 3 different techniques of ignition in their test procedures, all of which introduce major energy of ignition differences. We have agreed to run a joint program with MSC in order to select the ignition technique most appropriate for use in the specification.
5. MODERATE DEPTH LUNAR DRILL: The diamond bit developed by Westinghouse under contract NAS8-20845 was tested to a bit life of 25 feet into basalt at the Bureau of Mines on 2-18-69. This was a repeat of the tests conducted as part of this contract by the Hoffman Brothers on 2-6-69, when a bit of this same configuration was utilized to core in basalt to a depth of 17 feet. Both tests were conducted with the bit drilling dry and uncooled. Although this is considerably less than the 100-feet goal set for this contract, it reflects a minor breakthrough in the design of the diamond bits. The results are so encouraging that an attempt is being made to obtain funds to extend this contract until the end of FY-70. ✓

NOTES 2-24-69 HOELZER

2/24/69

B 2/26

THIRD GENERATION COMPUTER SYSTEM: We have received from UNIVAC what is essentially our final software version of the Executive system for the UNIVAC 1108. We placed it on the floor about two weeks ago and it has proven to be somewhat more instable than we had expected. This, plus continuing hardware difficulty in the drum storage area, makes the April 14 date doubtful as a starting date for acceptance testing. A strenuous effort is being exerted to stabilize both the software and the hardware of the system by Computation Laboratory and UNIVAC. UNIVAC is increasing its already large force here at Huntsville in an effort to meet the April 14 date. If we cannot make it, this probably means retaining our second generation equipment past the end of the fiscal year and would affect our previous estimates of the FY-70 budget. We will keep you informed on our progress. ✓



B 2/26

NOTES 2/24/69 JAMES  
2/24 JS

1. S-II POGO (Suspected) (Reference James' Notes 2/17/69): The analysis results to date have been inconclusive and nothing has been identified that would cause an impact to the Apollo 9 launch. P&VE will present a review of their analysis effort to date at 12:30 pm, Monday, February 24, in the 10th Floor Conference Room. A report will follow to Dr. Mueller and General Phillips by telecon at 2:00 pm Monday. ✓

LEW  
But see  
my remarks  
on S-II  
NOTES  
2/24 JS  
2. S-IC Control Structural Dynamics Instability: The S-IC control instability item covered in our February 17 notes has been determined not to be a problem. The 3-D (three dimensional) analytical technique which was being used for the first time in this control stability analysis (Co-planar technique used on the previous vehicles) contained errors associated with mass distribution. ✓

3. AS-504 CDDT Status: All the launch vehicle CDDT anomalies were minor and do not present any launch schedule problems. ✓

4. AS-505F Flight Program: The preliminary flight program was delivered February 20, 1969 on schedule. The final flight program will be delivered on April 1, 1969. The MSC request for changes to the software to provide for a greater separation distance between the S-IVB/IU and the spacecraft prior to the Service Propulsion System evasive burn will be forwarded to IBM today and will not impact the April 1 delivery. The delivery schedule continues to be tight. A large amount of overtime is being used to meet this delivery, thereby reducing our capability to incorporate subsequent changes as a result of problems. ✓

5. S-IC Intertank Umbilical Slow Retraction AS-503: The umbilical retract times on AS-503 were approximately two seconds longer than nominal. Failure analysis on the umbilical was conducted at Michoud to determine the cause of the slow retraction, since this could lead to launch holds or scrub if the interlock delay time was exceeded. The cause was found to be leakage in the control box pneumatic tubing. After correction of the leaks, separation time of the umbilical returned to normal. ✓

6. Saturn Follow-on Production Planning: Dr. Mueller has directed that we utilize our prime contractors in both reducing our contract/vehicle requirements (in order to produce the follow-on vehicles at less than half their present cost); and the development of the bid data packages. A meeting of the stage contractors has been scheduled for February 27 at KSC to discuss means of accomplishing these tasks. ✓

2/24/69

B  
2/26

OART MEETING ON IMPLEMENTING RTOP MANAGEMENT SYSTEM - Mr. Paul Cotton chaired the meeting. The discussions centered around the changes required to effect replacement of the Form 1122 (Description of Individual Research Task) as the program control document. In the Research and Technology Objectives and Plan (RTOP) management scheme, planning and control are to be exercised at something near a task area level; i. e., several tasks grouped together. ✓ The problems discussed included those concerning the adaptation of already existing data collection systems to the requirements imposed when management control is raised above the task level.

Official minutes of the meeting are being prepared by Headquarters. They will be distributed in the Center when available. Both OART and OMSF are planning to use the RTOP system in FY-70. OART will forward request for research proposals to the Centers within the next two weeks. These will be in lieu of guidelines, as provided in the 1122 system. As these requests are received, they will be coordinated with the laboratories for the purpose of formulating responses (bids) to OART on how we will do the work proposed. ✓ We will also make some "unsolicited proposals" to OART. ✓

DELTA FLIGHT FOR THERMAL RADIATOR EXPERIMENT - Several months ago it became evident that it would not be possible to fly the Phase Change Radiator Experiment, developed by SSL, easily on a Saturn Vehicle. As a consequence, we had begun considering flying the experiment on a Delta Flight as a passenger. No commitment has yet been made either by the Center or the Delta Program Office in OSSA. Conversations to date have been on an informal (probing for information) basis. We are now ready to make the contacts somewhat more formal. We will keep you advised of the results. ✓



B  
2/26

NEW APOLLO PROJECT APPROVAL DOCUMENT (PAD) A new Apollo PAD has been signed by Dr. Mueller and has been sent to Dr. Paine for approval. The new PAD is to ensure efficient use of the Apollo space vehicles after the first lunar landing and to begin a comprehensive set of lunar exploration missions. Assuming lunar landing success on vehicle 506 all subsequent payloads and vehicles will be associated with LEO. The PAD provides for additional payload development to include: increased astronaut mobility and lunar stay time, additional Apollo lunar surface experiments package (ALSEP) production, CSM modifications, and lunar orbital science experiments. A new MSF planning schedule is presently being developed relative to the new PAD and reflects Saturn V launches concurrent with the planned AAP core missions. The planning also includes a minimum of 3 Saturn V launches per year after Apollo. ✓

REQUESTED INCREASE TO FY 1970 BUDGET FOR MSF - Dr. Mueller has requested \$198M increased funding for Manned Space Flight. This was done with the belief that the nation needs a firm commitment to develop and operate a space station and a space shuttle; for assurance of maximum benefit from the lunar landing by funding an aggressive lunar exploration program; and also for assurance of continuity in our manned space flight endeavors by reinstituting Saturn V production early in fiscal year 1970. These moneys would be applied as follows:

	Johnson		
	<u>Budget</u>	<u>Additions</u>	<u>Proposed</u>
Apollo/Lunar	\$1,651.1	+ 79.0*	\$1,730.1
Space Stations	9.0	+ 66.8	75.8
Saturn V Production	-----	+ 52.2	52.2
Apollo Applications/Ops.	345.1	-----	345.1
Advanced Missions	2.5	-----	2.5
<b>TOTAL MSF</b>	<b>\$2,007.7</b>	<b>\$ 198.0</b>	<b>\$2,205.7</b>

\*Should the budget increase be denied, MSF may attempt to scrub down the Apollo program for the \$79.M additional LEO requirements. ✓

LB James  
with all that  
new money  
going to  
MSF,  
make sure  
we  
protect  
our  
vital  
interests  
in more  
comprehensive  
side by  
side testing and math modeling (PICO etc)  
of the SATV. See also Geissler and James  
NOTES 2/29  
B

also!



NOTES 2/24/69 MOHLERE

2/24/69

B 2/26

Remote Sensing. In discussions with Dr. Carl Thomas of the University of Tennessee, I find that the University has a considerable interest in remote sensing. What's more, this interest is rather aggressively pursued. The University owns a modified DC-3 which is assigned exclusively for research purposes. Structural mods have been completed to allow installation of practically any type of remote sensor excluding only radar. Equipment inventory includes a 5 camera Hasselblad system, infra red scanner with magnetic tape deck, aero magnetic equipment, and Doppler navigational gear. For ground truth equipment, they have, among other miscellaneous equipment, a continuous fluorometer, temperature, O<sub>2</sub> concentration and ph recorders, etc.

Dr. Thomas would be happy to bring the plane to MSFC for your inspection and for a presentation on its employment. ✓ The University has some ambitious and intriguing plans. I will be happy to arrange for such a visit if you wish. Please do B

Saturn History Contract. As of this writing, UARI has not yet hired a historian for the project. However, latest advice (one in a long line) indicates that a breakthrough is likely. Clyde Reeves states that either of two highly reputed academicians appear on the verge of accepting. One is a Dr. B. C. Hacker, Research Associate at the University of Houston, and the other is a Dr. J. B. Spencer, Assistant Professor, History of Science, Oregon State University. Should these fall through, he avows that he has a "young PhD waiting on the shelf." In the meantime, he has informed me that much important and necessary background investigative work is being completed. ✓

Thus, according to him, the project is moving ahead. ✓

By way of information, there have been 80 referrals for the job and 29 contacts of which 3 show some promise. Possibly Alabama's academic image could bear some refurbishing. ✓

Manufacturing in Space. University interest in space manufacturing appears to be on the rise. Early in the month I delivered a lecture on the subject at Clemson before the Chemical Engineering Society. On February 18, Hans Wuenscher of ME and Mario Rheinfurth of Aero presented papers at a UAH seminar under the direction of Dr. Kubitza. The seminar is aimed at assisting graduate students to find new and challenging research fields of modern technology. Hopefully, thesis research topics will emerge. ✓

Purdue, with one doctoral investigation under way in the field, is seeking a 3-lecture series on the subject for sometime during April or May with the expectation that interest will spread. ✓

NOTES 2/24/69 MURPHY

2/24 NS

B 2/26

Negative report

2/24/69

B. 2/26

GAO Facilities Review: Gen. Curtin briefed GAO representatives in Washington on February 14, regarding the draft audit report on MSFC facilities. Several points were established as a result of Gen. Curtin's presentation: First, GAO has apparently backed off from any claims of Anti-Deficiency violations. ✓ Second, Mr. Henig admitted that most of the differences involve matters of interpretation (that is, GAO is not so certain that any of the questioned projects are clearly "illegal"). ✓ Third, Mr. Henig announced that whatever report is issued will be sent to the Committees and not to the entire Congress. ✓ Fourth, GAO found much "new" material in the Curtin presentation and wanted time to consider it. ✓ And, finally, GAO suggested that NASA do nothing with respect to the twelve appendix projects until GAO decided what to do with them. ✓ The MSFC position received solid support from all the Headquarters' personnel. ✓ Since the above meeting, we have been informed that there are no suspense dates for official answers to any part of the draft report and that GAO would discuss the report with the House and Senate Committees on February 19 and 20. MSFC now has no further action on the report until we hear from Headquarters. ✓

ATM Clean Rooms: MSF is going to Congressional Committee for statutory re-programming of funds necessary to build ATM clean rooms in Buildings 4755 and 4708. They have asked for rewritten projects in C of F format and want the installation for a set of ACE combined with the 4708 clean room. Total amount of funds involved is between \$1.0 and \$1.3 million. It appears that the work in 4708 will be critical to the ATM schedule. ✓

Aircraft Condition: NASA 3's major structural members (wing and empennage attachments, spars, etc.) were x-rayed by Mohawk Airlines at Utica, N. Y. Sonic tests of the landing gear struts, bosses and actuating cylinder attach points were also made. No adverse conditions were indicated on initial examination of film. ✓ A full report and the film will be forwarded to us at a later date. ✓

Cafeteria Operations: The Automatic Retailers of America (ARA), operators of our cafeterias, advised us that if we did not take action to discontinue some cafeterias and snackbars on which they were losing money they would serve notice of their intent to terminate their contract with us. Our own surveys of the situation reveal that the daily number of customers has fallen off and that ARA is losing money. In view of the position taken by ARA, we are planning to close the snackbars in Astrionics, P&VE, and Test Laboratories, close the cafeteria in ME Lab., and convert the cafeterias in Buildings 4202 and 4481 to snackbars. We believe these moves will be satisfactory to ARA so that they will continue their operation until June 1969 when the contract will be recompeted. ✓



NOTES 2/24/69 RICHARD

2/24/69

B 2/26

Transposition Docking and LM Ejection (TD&E) for AS-504 (Re: Questions by Dr. Rees on MSFC/MSC analyses for this phase of the mission):

1. The LM Ejection scheme is a MSC/NAR design without any design inputs from MSFC. However, the characteristics of the system were furnished to MSFC via the Mechanical Panel, and we did confirm that it is compatible with the L/V capabilities/requirements. ✓
2. MSFC has furnished to MSC the characteristics of the L/V (such as limit cycle rates for vehicle control, LH2 continuous vent thrust levels, etc.) for input to their analyses of the separation scheme. The analyses reviewed to date by MSFC personnel indicates that the scheme is a satisfactory one. ✓
3. A MSFC/MSC meeting was held on 9/5/68 to discuss the sequence of events for CSM/SLA separation, docking and LM/SLA separation. Based on the data presented and discussed at this meeting, the primary MSFC concern was that time critical sequences such as LM tension tie and umbilical guillotine initiation may have inadequate margins for some failure cases. Mr. A. Cohen/MSC took an action to review the FEA to assure proper sequencing of these functions. A copy of a letter from Mr. Low to Mr. James and also an abstract on results of the joint meeting are forwarded to you and Dr. Rees separately. ✓
4. ST-124 platform failure or a failure in the APS system will not prevent CSM separation. CSM/LM docking can be performed with a platform failure using rate control mode. The L/V system can also recover from CSM "bumping" or "unsuccessful docking." After CSM/LM hard docking has been effected final separation (i. e., CSM/LM Ejection from the L/V) can be effected with vehicle rates up to about  $.4^{\circ}/\text{sec.}$  with physical contact occurring at rates of about  $.8^{\circ}/\text{sec.}$
5. We understand MSC is reconfirming the transposition, docking, and extraction modes from their standpoint just as we have. ✓

NOTES 2-24-69 SIEBEL

2/24/69

3 2/26

No significant items to report.

NOTES 2/24/69 SPEER

2/24/69

B  
2/26

1. AS-504 Status: The Countdown Demonstration Test (CDDT) Wet was completed on 2/18 and the Dry Test completed on 2/19. At this time the launch is still scheduled for 2/28. KSC has modified the launch countdown to include two 8-hour holds and one 3-hour hold in an attempt to assure a launch on time. ✓
2. AS-504 Flight Control Contingency Plan: The AS-504 Contingency Plan, prepared by our Flight Control Office, is presently being reviewed by cognizant MSFC elements. This plan will be utilized to complete as many launch vehicle test objectives as possible by ground command in the event malfunctions occur which preclude S-IVB restart. Some of the tests covered by the plan are: (a) 02/H2 Burner Start and Restart; (b) Fuel Lead; (c) Propellant Dump; (d) Thrust Vector Control during Dump; (e) Stage Safing; (f) APS Burn to Depletion; and (g) Cyclic Tank Venting. The GO/NO GO recommendation for initiating applicable parts of the plan and the sequencing of the items in the event of a contingency will be determined at HOSC during the mission. ✓
3. Saturn V/MSS Wind Constraints: You will recall KSC's latest wind constraint concern, raised just prior to the 504 Flight Readiness Review, over the limit for collision between vehicle and MSS access platforms. The problem involves reduced clearances on the LM platforms, violation or misunderstanding of several ICD's, inadequate KSC data on MSS deflections, and must be basically solved within KSC. However, since it is wind-related, Gen. Phillips has asked MSFC to lead in developing a plan of action to formally establish revised constraints and documentation. The Saturn V Program Office is taking the necessary action to resolve this with KSC and MSC and we are supporting them. ✓
4. Apollo Orbital Debris: On 2/27/69, we met with R&DO and Saturn Program Office elements to discuss a response to Gen. Stevenson's letter requesting an assessment of orbital debris resulting from flight anomalies which preclude translunar injection on post-Apollo 9 missions. MSFC was asked to evaluate risks and possible actions, including coordination with MSC of LM and ALSEP aspects. Since hazards from the reentry of S-IVB/IU on these missions are significantly smaller than those accepted on previous Saturn IB and V flights (where the S-IVB stayed in earth orbit), it was agreed we should ask for specific Headquarters direction prior to expending any significant effort to investigate or implement any controlled reentry technique (e.g., by controlled propellant dump in retro attitude). We will recommend that the risk be accepted. ✓



NOTES 2-24-69 Stuhlinger

2/24/69

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No submission this week.

2/24/69

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2/26

1. Post Apollo Lunar Planning: We received a letter from Headquarters (Stoney) confirming agreements reached at the February Management Council Meeting. The centers will continue study of advanced lunar missions with the next reporting date at the April Management Council Meeting. The Apollo Program Office is to submit for approval a Missions Assignment Document for the initial four landings. Remaining flights (through 515) will be the primary subject of study during this next time period. Principal study objectives are to (1) present scientific cost effectiveness of various program options and (2) examination and comparison of various lunar options regarding their interaction with possible new start activities and the AAP program. The major part of the effort will fall on MSC, which will be responsible for developing engineering and mission sections of the study. Apollo Lunar Exploration (MAL), Headquarters will be responsible for scientific evaluations and Apollo Program Control (MAP), Headquarters will coordinate resource inputs from the centers. As discussed during the February Management Council Meeting, the study will assume retention of capability for continuous launch of the Saturn V throughout the AAP missions. An initial meeting regarding guidelines and work schedule will be held at MSC, Houston, on February 25, 1969. Program Development, Systems Engineering and Saturn V will be represented at the meeting. H. Becker will continue as "team captain" for this effort. ✓

2. ILRV Studies: Orientation meetings for the two MSFC contractors (General Dynamics/Convair and Lockheed Missile & Space Company) were held at MSFC on February 18, 1969. C. M. Akridge, R-AS-SV, participated in similar orientation meetings at Langley (McDonnell-Douglas) on February 19, 1969, and MSC (NAR) on February 20, 1969. ✓